United States
Department of
Agriculture

Forest Service
Southern Region

Final Environmental Impact Statement

APPALACHIAN INTEGRATED PEST MANAGEMENT (AIPM)

Gypsy Moth Demonstration Project

Management Bulletin R8-MB 33

February 1989

U. S. DEPARTMENT OF AGRICULTURE
Forest Service - Northeastern Area State & Private Forestry
370 Reed Rd.
Broomall, PA 19008

Metric Conversions

1 inch	2.54 centimeters
1 foot	30.48 centimeters
1 square foot	0.0929 square meters
1 acre	0.4047 hectare

Cover Photo: Defoliation in Pennsylvania

United States Department of Agriculture | Forest Service | Northeastern Area State and Private Forestry | 370 Reed Road Broomall, PA 19008

Reply To: 1950 (GMEIS)

Date: February 8, 1989

Dear Reader:

Enclosed for your information and use is the Final Environmental Impact Statement (FEIS) for the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project.

In accordance with the Council on Environmental Quality procedures 40 CFR 1506.10(b)(2), a decision shall be issued no sooner than 30 days after the Notice of Availability of the FEIS is published in the Federal Register. The Record of Decision will state the decision as well as identify and discuss the relevant factors considered in reaching the decision. A copy of the signed Record of Decision will be mailed to you when it is issued.

Please feel free to contact David P. Smith, AIPM EIS Team, Suite 718N, 1720 Peachtree Rd., NW, Atlanta, GA 30367 or you may call at (404)347-4338 if you have any questions regarding this FEIS.

Sincerely,

Michael T Rains

MICHAEL T. RAINS
Area Director

Enclosure

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE
APPALACHIAN INTEGRATED PEST MANAGEMENT (AIPM)
GYPSY MOTH DEMONSTRATION PROGRAM

All or part of the counties of Barbour, Fayette, Grant, Greenbrier, Hardy, Harrison, Marion, Mercer, Monongalia, Monroe, Nicholas, Pendleton, Pocahontas, Preston, Randolph, Taylor, Summers, Tucker, Upshur and Webster in West Virginia. All or part of the counties of Albermarle, Allegheny, Amherst, Augusta, Bath, Bedford, Botetourt, Craig, Greene, Highland, Madison, Nelson, Page, Rappahannock, Roanoke, Rockbridge, Rockingham, and Shenandoah in Virginia.

Responsible Agency:	USDA Forest Service
Responsible Official:	Northeastern Area Director, State & Private Forestry
For Further Information, Contact:	David P. Smith, EIS Team Leader USDA Forest Service, Southern Region 1720 Peachtree Rd., NW Atlanta, GA 30367 Telephone: (404)347-4338; FTS 257-4338

Abstract: The Final Environmental Impact Statement (EIS) documents the results of an environmental analysis of six alternatives which were developed for managing the gypsy moth on Federal and non-Federal lands in the counties of Virginia and West Virginia (listed above) that make up the Appalachian Integrated Pest Management (AIPM) Project Area.

This EIS analyzes six program alternatives in detail. It does not disclose potential site-specific impacts and therefore, does not fulfill NEPA requirements for taking actions at this time that could cause environmental impacts. It provides the opportunity to tier site-specific analyses and appropriate NEPA documentation when specific areas and proposed action or actions are known so the issues can be narrowed to the proposed site-specific actions.

SUMMARY

PURPOSE AND NEED

The primary purpose of this program Environmental Impact Statement (EIS) is to provide guidelines for tiering future site-specific analysis and additional National Environmental Policy Act (NEPA) documentation as needed for managing gypsy moth under the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project in the 12.8 million-acre Project Area (figure I-1). This EIS is not site specific and does not fulfill NEPA requirements for taking actions at the project level. Site-specific analysis and appropriate NEPA documentation will be required once gypsy moth populations and specific management actions or alternatives have been identified. This EIS can be used for tiering when site-specific NEPA documents are prepared. In such cases, the issues in these documents can be narrowed to the proposed actions at the project level. Coordination with landowners and land managers is also required at the project level to ensure that proposed actions are consistent with the site management objectives and the managing agency's policies.

In 1985, an EIS was prepared for the current gypsy moth cooperative suppression/eradication program which includes many of the same tactics considered for use under AIPM. The AIPM EIS is needed because the AIPM Program is new and considered a significant Federal action that differs from the current programs. Differences between the 1985 EIS and addendum and this EIS are keyed to four facts:

1. This is a demonstration project and not a normal Forest Service or APHIS suppression or eradication project;

2. Low-level gypsy moth population intervention tactics are included;

3. This is a 100 percent-Federally funded project as opposed to cost-share projects between the Federal, State, and local governments and;

4. There are lands within the Project Area that may require several options within an alternative so a tactic or combination of tactics can be selected to be consistent with management objectives of these areas.

The AIPM Project has four objectives. First, it seeks to slow the spread and reduce adverse effects of gypsy moth within the project area. Second, the project is designed to develop and evaluate an integrated pest management (IPM) approach that can be implemented anywhere in the United States. Included are sampling methods, decision matrices for gypsy moth intervention activities, computer-based geographic information systems, and an educational program. Third, the project will develop and evaluate intervention tactics for the management of isolated gypsy moth populations within the Project Area. Fourth, the project will assess the feasibility of a coordinated County, State, and Federal gypsy moth program over a large geographical area.

The Project Area includes private, municipal, county, State and Federal land. All lands within the project area are eligible for treatment without cost to the landowner. However, participation in the project is voluntary.

BIOLOGY OF THE GYPSY MOTH

The gypsy moth was brought to the northeastern United States in 1869 from Europe. It has slowly spread south and west and has now spread into Virginia and West Virginia (figure I-2).

The gypsy moth causes its damage in the larval or caterpillar stage, when the insects feed on foliage of susceptible vegetation. The larvae emerge from eggs about the time the first tree leaves come out in spring. The newly hatched larvae are very small. They climb to the top of trees, suspend themselves on a silken thread, and are blown by the wind to adjacent areas. This is how they spread naturally.

They can also spread artificially if egg masses are deposited on vehicles or articles transported by vehicles to uninfested areas. The larvae can emerge and if the adult moths mate an isolated infestation can become established.

The larvae begin feeding and pass through life stages increasing in size. Their preferred food is oak foliage. If an area becomes completely defoliated, larvae crawl to adjacent areas to feed.

The larvae complete their development by early July, emerging a final time as moths. The male moths emerge first and are active fliers. Emerging females cannot fly. They crawl to suitable sites where they release a strong sex attractant called a pheromone. This chemical attracts the male to the female and they mate. Females deposit their buff-colored egg masses containing a few hundred to 1,000 eggs. The eggs hatch the following spring and the cycle is repeated. The size of egg masses give an indication as to the health of populations. Dime-size egg masses usually indicate declining populations, while quarter-size or larger masses denote building populations.

Gypsy moth outbreaks occur in 5- to 7-year intervals on the average. The worst outbreak in history occurred in 1981 when almost 13 million acres were defoliated. Outbreak phenomenon is not fully understood, however, it is known that weather has an influence.

SCOPING

In March of 1988, over 3,000 scoping letters were mailed. These letters asked the public to submit issues related to the proposed AIPM Project. In addition, the news media was provided with articles informing the public of the proposed project and how to become involved in the EIS process. A total of 314 letters was received. These letters were analyzed and five major issues were developed. They are:

1. Impacts of treatment on nontarget organisms;
2. Impacts of gypsy moth infestations;
3. Impacts on special management areas;
4. Effectiveness of intervention tactics;
5. Impacts to human health.

INTERVENTION TACTICS

The following intervention tactics can be used alone or in various combinations for managing gypsy moth populations as needed in the AIPM Project Area:

1. Disparlure. (Gypsy moth-specific tactic). This is the artificially produced gypsy moth sex attractant used to disrupt mating activity of small low-level populations. It is produced as 2" x 2" square plastic tape that is stapled to trees or as 0.1" long flakes that are dropped on the area from aircraft.

2. Release of Sterile Life Stages. (Gypsy moth-specific tactic). This technique involves the release of sterile life stages of the gypsy moth to reduce or eliminate isolated, low-level populations of gypsy moth. One method is to release laboratory-reared sterile male moths into an area so the male moths can mate with native female moths. Following mating, the native females produce sterile eggs that will not hatch the following year. Release and dispersal of the sterile male moths is usually applied from the ground. The second method involves the partial sterilization of male moth pupae, which emerge as adults and are mated with female moths in a laboratory. The females produce sterile eggs that are collected and dispersed in areas with low gypsy moth populations. Dispersal can be done from the ground or air. The eggs hatch the following spring and the insects complete their life cycle. The adult males mate with native females. The native females produce sterile eggs that will not hatch the following year.

3. Mass trapping. (Gypsy moth-specific tactic). The traps resemble milk cartons and contain the pheromone sex attractant. These are dispersed in an area containing low-level gypsy moth populations. Male moths are attracted and trapped by this device, thus inhibiting the mating cycle.

4. Nucleopolyhedrosis Virus (NPV). (Gypsy moth-specific tactic). This is a naturally occurring virus that affects only gypsy moth. It is produced by the USDA Forest Service in limited quantities. It is applied from the ground or air and deposited on tree foliage. When gypsy moth larvae eat sprayed leaves, the virus causes larvae mortality.

5. Bacillus thuringiensis (Bt). (Biological tactic). This is a naturally occurring bacteria that can also be produced commercially. It is normally applied from the air and deposited on tree leaves. When the gypsy moth larvae eat the sprayed leaves, the bacteria causes larvae mortality. The strains of Bt used for gypsy moth control only affect Lepidoptera insects. Bt is normally used on moderate to high gypsy moth populations.

6. Diflubenzuron. This is a chemical insecticide. It is normally sprayed from the air and deposited on tree leaves. The gypsy moth larvae eats the leaves and the chemical inhibits the molting process, thus killing the insect. It has the potential to affect other organisms which contain chitin and that may ingest the chemical. Diflubenzuron is normally used on moderate to high gypsy moth populations.

7. Parasites and invertebrate predators. This tactic involves the introduction of parasites and invertebrate predators in areas with low to moderate gypsy moth populations. Some of these arthropods only affect gypsy moth while others will attack various insects.

ALTERNATIVES

A total of 14 alternatives was considered in the EIS for the AIPM Program. Eight of these alternatives were eliminated for various reasons (see Chapter II, Alternatives Considered but Eliminated). Six alternatives were considered in detail, including the preferred alternative, alternative 5.

As stated, the EIS is for the AIPM Program. The alternative selected from this document will set the limits of what options and under what conditions those options can be used to manage gypsy moth within the AIPM Project Area. Before taking intervention action, further site-specific analysis and appropriate NEPA documentation will be prepared once specific gypsy moth infestations have been identified. This analysis will determine the appropriate option or combination of options to meet the suppression objectives based on the issues brought forth during additional scoping. In general, it is desirable to use the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives.

Not all lands will be treated if an alternative to implement the AIPM Program is selected. Participation by landowners and land managers in the AIPM Project Area is voluntary. Therefore, situations may arise where monitoring indicates a possible need for intervention, but landowner preference or managing agency policies prohibit or restrict any action. This situation is expected to occur within an area as large as the AIPM Project Area since it contains diverse ownerships and land management objectives. Such complexity must be factored in to any gypsy moth management program. For this reason, the Program alternatives contain a range of options to accommodate landowners and land management agencies within the AIPM Project Area.

There are 15 wildernesses within the AIPM Project Area. The Forest Service administers 14 wildernesses and the National Park Service administers 1 in the Shenandoah National Park. Under National Park Service policy, no action will be considered in the Shenandoah wilderness to manage gypsy moth under any of the alternatives developed in this EIS. However, alternatives 4, 5 & 6 provide the opportunity to manage gypsy moth populations in the 14 wildernesses administered by the Forest Service. Action in Forest Service wildernesses to manage gypsy moth populations under the AIPM Project will not be the normal course of action. However, public input and consultation with several key environmental groups concerned with the management of wilderness surfaced 4 specific conditions or circumstances under which gypsy moth population management could be considered necessary in wilderness. The Forest Service would consider action in wilderness to:

1. Protect a threatened or endangered plant or animal species or critical habitat of a species so designated.

2. Prevent a sudden change (approximately 1-2 years) in the wilderness ecosystem to protect wilderness character.

3. Protect an unique or rare ecosystem that is likely to be severely affected by gypsy moth.

4. Protect the forest resources on private lands adjacent to wilderness from adverse effects of gypsy moth populations inside wilderness provided these private forest resources could not be adequately protected by actions

taken outside wilderness. Technical assistance and 100% funding would be provided to these landowners in order to protect their resource from the possible adverse effects of gypsy moth populations inside wilderness.

As stated, the normal course of action will be to take no action in Forest Service administered wildernesses within the AIPM Project Area and allow the wilderness ecosystem to adapt to the presence of gypsy moth. It is only when one of the 4 extreme conditions that could potentially occur, does, that actions in wilderness would be considered. Tactics having the least adverse effects on the wilderness resource will be used if possible. Authority and guidance for considering action in wilderness is provided in the Wilderness Act and USDA Forest Service Manual direction for wilderness management.

The Shenandoah National Park and Blue Ridge Parkway as well as a section of the Appalachian National Scenic Trail between Jarman Gap and Rockfish Gap are included in the AIPM Demonstration Project and will participate in the project by having their Congressionally-mandated wilderness and lands zoned "natural" to be used to determine the rate of spread and impacts of gypsy moth in untreated areas of the Project Area. Research on impacts of the gypsy moth on native animal and plant populations in the Park will continue in these areas and some small scale methods improvement evaluations of gypsy moth-specific tactics might be conducted as well.

The six alternatives considered in detail are:

1. No action. The AIPM Program would not be implemented. Current suppression/eradication programs would continue.

2. In the General Project Area, the options available are to:

    a. Take no action, monitor only;
    b. Manage gypsy moth populations with gypsy moth-specific tactics;
    c. Manage gypsy moth populations with biological tactics;

    In wilderness, gypsy moth populations would not be managed.

3. In the General Project Area, the options available are to:

    a. Take no action, monitor only;
    b. Manage gypsy moth populations with gypsy moth-specific tactics;
    c. Manage gypsy moth populations with biological tactics;
    d. Manage gypsy moth populations with diflubenzuron.

    In wilderness, gypsy moth populations would not be managed.

4. In the General Project Area, the options available are the same as alternative 3.

    In wilderness, the options available are to:

    a. Take no action, monitor only.
    b. Manage gypsy moth populations as necessary with gypsy moth-specific tactics.

5. In the General Project Area, the options available are the same as alternative 3.

   In wilderness, the options available are to:

   a. Take no action, monitor only;
   b. Manage gypsy moth populations as necessary with gypsy moth-specific tactics;
   c. Manage gypsy moth populations as necessary with biological tactics.

6. In the General Project Area, the options available are the same as alternative 3.

   In wilderness, the options available are to:

   a. Take no action, monitor only;
   b. Manage gypsy moth populations as necessary with gypsy moth-specific tactics;
   c. Manage gypsy moth populations as necessary with biological tactics;
   d. Manage gypsy moth populations as necessary with diflubenzuron.

Table II-4 in Chapter II, provides a summary of the potential environmental consequences of each of these alternatives. Mitigating measures to reduce these potential impacts are listed at the end of Chapter II.

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PURPOSE AND NEED FOR ACTION

Female adult gypsy moth laying egg masses

CHAPTER I

PURPOSE AND NEED FOR ACTION

INTRODUCTION

This chapter presents an explanation of why the final environmental impact statement has been prepared. It explains the purpose of the proposed action, scope, and the need for action. The proposed action that is addressed by the EIS is described, and the statutory authorities that apply to the EIS in relation to the proposed action are listed. The process used for identifying the major issues concerning the proposed action, as well as a summary of the issues themselves, is presented.

PURPOSE

The purpose of this programmatic EIS is to provide guidelines for future site-specific project analysis and National Environmental Policy Act (NEPA) documentation for managing gypsy moth under the new 5-year Appalachian Integrated Pest Management (AIPM) Demonstration Project. It is the initial step in the Program's compliance with NEPA. This EIS does not disclose site-specific environmental impacts. Subsequent environmental analysis and NEPA documentation will be tiered to this document and disclose the site-specific impacts of any proposed action under this Program. Relevant information and analysis contained in this document can be incorporated by reference when future environmental assessments or EIS documents are needed for site-specific projects to manage the gypsy moth in the AIPM Project Area. This will allow the issues in these documents to be narrowed to the proposed actions at the project level.

Alternative 1 is the no-action alternative, which would not implement the Program. Alternatives 2 through 6 would allow AIPM Program implementation. These alternatives identify a range of intervention tactics permitted in the Project Area to meet the Program's objectives and the conditions under which they may be implemented. The potential consequences to the environment of each alternative, if implemented, are analyzed and documented. Mitigation measures to reduce these potential impacts are also displayed.

SCOPE OF THE EIS

The Project Area includes all or portions of 18 counties in Virginia and 20 counties in West Virginia, totalling approximately 12.8 million acres (figure I-1). Within the area are the George Washington, Jefferson, and Monongahela National Forests, Shenandoah National Park and Blue Ridge Parkway. The project includes privately-owned land as well as municipal, county, State and Federal land. Cooperation of these landowners and managers is needed in coordinating activities proposed within the Project Area. All lands within the project area are eligible for intervention tactics without cost to the landowner. Participation in the project is voluntary.

The AIPM project has four objectives. First, it seeks to slow the spread and reduce the adverse effects of gypsy moth within the project area. Second, the project is designed to develop and evaluate an integrated pest management (IPM) approach that can be implemented anywhere in the United States. Included are sampling methods, decision matrices for gypsy moth intervention activities, computer-based geographic information systems, and an educational program. Third, the project will develop and evaluate various intervention tactics for the management of isolated gypsy moth populations within the Project Area. Fourth, the project will assess the feasibility of a coordinated County, State, and Federal gypsy moth program over a large geographical area.

This final environmental impact statement is not site specific. It is an EIS for the AIPM Program, and the potential impacts of six alternatives that could be implemented to manage gypsy moth populations within the AIPM Project Area are analyzed. However, none of the alternatives require that intervention be taken. The decision to take action will be made at the project level following site-specific environmental analyses and further documentation under NEPA as needed. This EIS provides background information to which future project level, site-specific environmental analyses and appropriate NEPA documentation can be tiered. Alternatives are described which include the Forest Service's preferred alternative and the no-action alternative. The EIS displays alternatives in terms of intervention tactics, impacts, and constraints. The affected environment is discussed, as well as the potential environmental consequences of implementing any of the alternatives.

The part of the Shenandoah National Park that is located in the eastern edge of the AIPM Project Area contains 53,919 acres of Congressionally mandated wilderness and 81,257 acres of land zoned "natural" by the National Park Service (NPS) will participate in the AIPM Project by serving as a comparison area. Similar designations on the Blue Ridge Parkway (4,700 acres) and a section of the Appalachian National Scenic Trail between Jarman Gap and Rockfish Gap (approximately 1,500 acres) will also participate as comparison areas. These areas will receive the same monitoring attention as the Project Area and parts of these areas will be used to determine the rate of spread and impacts of the gypsy moth in untreated areas to treated areas in the remainder of the Project Area. Research on impacts of the gypsy moth on native animal and plant populations in the Park will continue (see Appendix F for research activities on the Shenandoah National Park). The wilderness and natural areas may also be considered for small scale methods development applications (less than 3,000 acres total) of gypsy moth specific tactics such as the nucleopolyhedrosis virus (Gypchek). The use of gypsy moth specific methods may also be considered for use on other NPS natural areas such as those segments of Blue Ridge Parkway which have been included as part of the AIPM Project Area.

The primary objectives of the project are to slow the spread and reduce the damage caused by gypsy moth defoliation regardless of economic values. As such, an economic analysis is not appropriate. However, an economic accounting of the project will be conducted. The financial records will be maintained by year, by group or agency, and by type of activity. At the conclusion of the project, it will be possible using this system to determine the absolute costs of all project activities and the cost efficiency of the intervention tactics will be calculated.

NEED

Since its introduction to the United States in 1869, gypsy moth has defoliated forest and ornamental trees on over 93,000 square miles. In the 1987 Supplemental Appropriation, Congress funded a Forest Service project to slow the spread and to reduce the adverse effects of gypsy moth. In response, the AIPM Program was created to demonstrate the effectiveness of new and existing technology for managing the gypsy moth on Federal, State, and private lands within the AIPM Project Area. After an analysis of the planned activities, scope of the Project Area, and existing NEPA documents, it was determined that this was a major Federal action and that an EIS would be required under NEPA. The Forest Service is examining a range of alternatives for the AIPM Project Area for managing gypsy moth. Alternatives developed vary by the management objectives of land parcels within the project and by proposed intervention tactics. The Forest Service preferred alternative, as well as other alternatives and a summary of their impacts to the environment, are displayed in table II-4.

In 1985, the Forest Service and the Animal and Plant Health Inspection Service (APHIS) issued a final EIS, Gypsy Moth Suppression and Eradication Project (USDA FEIS, 1985a). The 1985 EIS and subsequent addendum were developed by the Forest Service and APHIS for suppressing or eradicating gypsy moth infestations on Federal and non-Federal land in cooperation with State and Federal agencies. As appropriate, material from the 1985 EIS and addendum will be summarized and incorporated by reference in this EIS.

Differences between the 1985 EIS and addendum and this EIS are keyed to four facts: (1) this is a demonstration project and not a normal Forest Service or APHIS suppression or eradication project; (2) low-level gypsy moth population intervention tactics are included; (3) this is a 100 percent Federally-funded project as opposed to cost-share projects between the Federal, State, and local governments and (4) there are lands within the Project Area that may require several options within an alternative so a tactic or combination of tactics can be selected to be consistent with management objectives of these areas.

This EIS responds to the requirements of NEPA (40 CFR Parts 1500-1508), the Council on Environmental Quality (CEQ) regulations for implementing NEPA, the Department of Agriculture's procedures for implementing NEPA (7 CFR 1b), and Forest Service environmental policy and procedures (FSM 1950 and FSH 1909.15).

STATUTORY AUTHORITIES

The Forest Service is governed by the following laws that pertain to gypsy moth management:

1. The Cooperative Forestry Assistance Act (1978). This Act incorporates provisions of the repealed Forest Pest Control Act of 1947. The Act authorizes insect and disease management on Federally-owned forest lands and Federal/State cooperation in forest insect and disease management work.

   Because the Nation depends on non-Federal forest lands for timber and other forest resources, the Secretary of Agriculture is authorized to help control insects and diseases on forest lands of all such owners. Protection of forest resources helps enhance the growth and maintenance of trees and forests. This program also helps to promote the stability of forest-related industries.

2. The National Environmental Policy Act (1969, as amended 1982). Section 102(2)(c) of this Act requires that a detailed EIS be prepared for proposed major Federal actions that may significantly affect the quality of the human environment.

3. The Federal Insecticide, Fungicide, and Rodenticide Act (1984). This Act requires that insecticides used in suppression projects be registered by the Environmental Protection Agency (EPA).

4. The Wilderness Act (1964). Congress passed the Wilderness Act "to secure for the American people of present and future generations, the benefits of an enduring resource of wilderness." However, section 4(d)(1) states, "In addition, such measures may be taken as may be necessary in the control of fire, insects and diseases, subject to such conditions as the Secretary deems desirable."

AIPM PROJECT AREA
WEST VIRGINIA & VIRGINIA

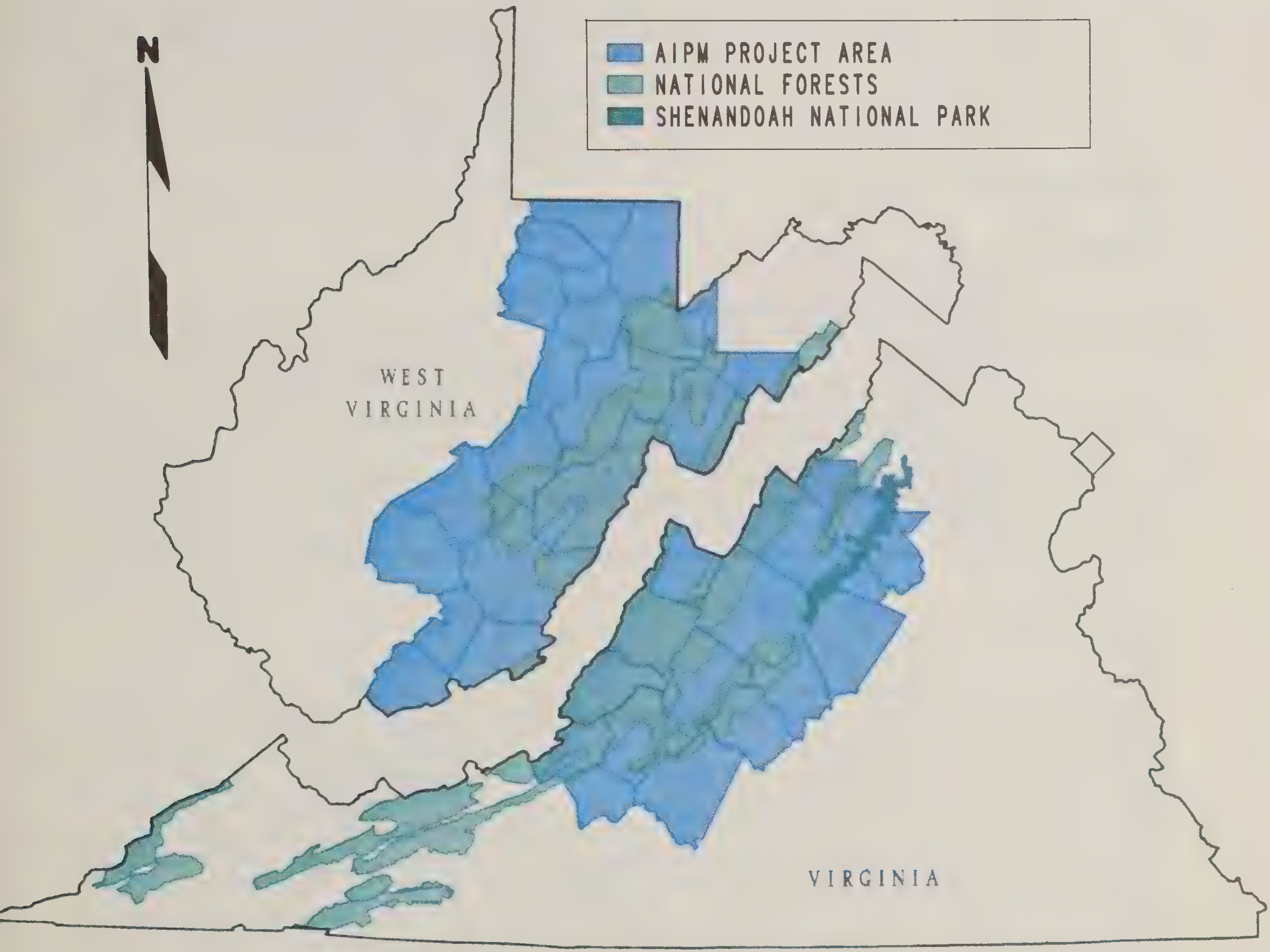

FIGURE I-1.- THE PROJECT AREA INCLUDES 20 COUNTIES IN WEST VIRGINIA AND 18 COUNTIES IN NEIGHBORING VIRGINIA.

5. The Endangered Species Act (1982). The purpose of this Act is "...to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species... "The Act further declares that "[it is] the policy of the Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purpose of this Act."

6. The 1987 Supplemental Appropriations Bill. The Congress of the United States directed the Forest Service to develop an integrated pest management project aimed at slowing the spread and minimizing the adverse effects of the gypsy moth. The AIPM Gypsy Moth Demonstration Project was developed in response to this direction. The project is to apply existing knowledge and technology in the mountains of West Virginia and Virginia on Federal, State and private lands. The goal is to employ an integrated pest management approach to minimize adverse effects and to slow the spread of the pest through the area.

BIOLOGY OF THE GYPSY MOTH

Distribution

The gypsy moth (Lymantria dispar L.) is one of the most damaging insect pests of hardwood trees in the eastern United States. The gypsy moth was introduced into the Boston, Massachusetts, area in 1869 and has slowly become established north through all of New England and portions of southern Quebec, south to Delaware and Maryland and west through New York, Pennsylvania, northern Virginia, and northeastern West Virginia (figure I-2). Also, an isolated area in central Michigan has now become permanently infested. Movement of infested vehicles, equipment, and materials from the Northeast has resulted in isolated infestations occurring in such states as Arkansas, California, North Carolina, Oregon and Washington. Upon detection, isolated infestations have been treated for eradication by APHIS and cooperating State agencies.

Life Cycle and Biology

The gypsy moth produces one generation per year. Like other tree-defoliating insects, the gypsy moth does its damage during the larval stage. In the Northeast, larvae begin to emerge from egg masses in late April or early May. The first hatch is determined by temperature and usually coincides with budbreak of most hardwood trees. Egg hatch generally occurs in 3 to 5 days, but in some situations hatch may occur over a period of 2 to 3 weeks. The newly-hatched larvae are about 0.10 of an inch long and buff-colored, but turn black within a few hours. The larvae remain on or adjacent to the egg mass for several days if it is cold or raining. When conditions are favorable, the larvae climb to the tops of trees or other objects. They do not feed but suspend themselves on silken threads and are dispersed by the wind to adjacent trees or forests. The distance that the small caterpillars may be dispersed by the wind is a source of controversy. Early researchers were convinced that long-range dispersal was common in the northeast. However, Mason and McManus (1981) concluded that, in non-mountainous terrain, 99 percent of the larvae would be deposited within about 0.6 of a mile of their source. In mountainous areas, where turbulence and updrafts are more pronounced, an atmospheric dispersion model predicted that most larvae would land within 2 miles downwind (Mason and McManus 1981). Extensive aerial sampling of larvae over heavily infested ridges in Pennsylvania by Taylor and Reling (1986) suggests that about 3 percent may have the opportunity to travel up to 12 miles in one episode. This method of spread, which

GYPSY MOTH SPREAD, 1869-1987

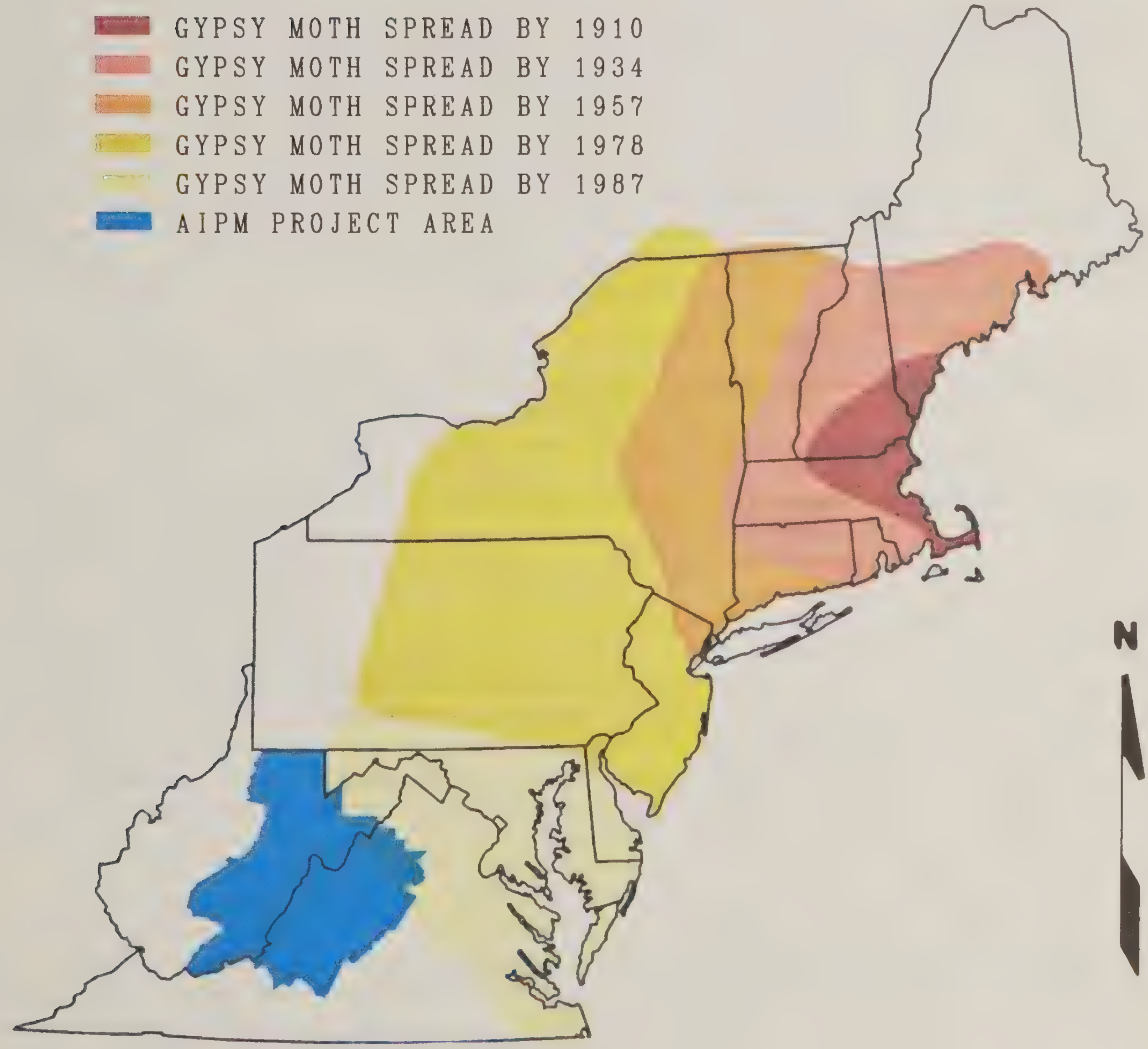

FIGURE I-2.- DISTRIBUTION AND RATE OF GYPSY MOTH SPREAD IN THE EASTERN UNITED STATES.

may last for 2 weeks, is the primary method by which the insect infests new areas. In addition, the movement of campers and outdoor furniture from infested areas to uninfested locations in the United States and Canada is often responsible for artificial introductions of the insect into new areas (McManus 1980). Larvae may go through several dispersals before landing on a suitable host where they begin to feed. As they feed, the larvae pass through several stages (instars), shedding their skin as they grow. Male larvae usually pass through five stages, and females through six. Depending on the temperature and available food, each stage lasts about 4 to 10 days.

The larvae develop their characteristic markings by the fourth stage, consisting of five pairs of blue spots followed by six pairs of brick-red spots running down the larvae backs. At low-to-medium population levels, the larvae rest during the day under bark flaps or crevices, in cavities, or under broken limbs. It is thought that this cover protects them from natural enemies active during the day. If suitable sites are not found on the tree, the larvae will descend to the ground and rest under logs, rocks or other objects, where insects and small mammals may eat them. When populations are high, the larvae remain on the foliage and feed day and night. When hardwood trees are completely defoliated, the larvae may move short distances into adjacent woodlands in search of food (McManus 1980).

Depending on the geographic location in the East, most larvae complete their development by early July and undergo pupation in protected sites on trees or other objects. The brown-colored pupae are immobile and defenseless for about 2 weeks. The dark brown male gypsy moths emerge before the females, are strong flyers and are most active during the daylight hours. The heavy-bodied female moths are nearly white and cannot fly but crawl to suitable sites to lay their eggs. The females release a strong sex attractant to attract male moths to their site for mating. After mating, the females deposit their eggs in well-defined tan or buff-colored masses that may contain from a few hundred to nearly a thousand eggs. Soon after mating, the females die, but males survive for a few weeks. In about 6 weeks, the embryos develop into larvae that remain in the eggs during winter and hatch the following spring. The size of the egg masses in a given area provides information on the health of the population. Small egg masses, about the size of a dime, indicate that the population in the area is stressed and is on the decline. Such declines may be the result of lack of food, poor-quality food, or the build-up of a nucleopolyhedrosis virus (NPV) in the population. Large egg masses, about the size of a quarter or slightly larger, indicate a building population.

Feeding Activity

Upon landing on suitable foliage, the larvae begin feeding. First instar larvae chew small holes in the leaf and rest on a mat of silken threads on the underside of the leaf. Second and third instar larvae feed at the leaf margins and rest beneath branches and twigs. Larval behavior changes upon entering the fourth instar. The larvae feed at night and descend the tree to rest in protected locations throughout the day (McManus 1980). Feeding activity of light larval populations causes little noticeable defoliation in a forested community or hardwood stand. In comparison, defoliation by moderate populations is often evident in the upper crown portions of the tree or at the outer edges of the crown. Such trees are often interspersed among other hardwoods showing only light evidence of feeding.

Defoliation becomes very apparent early in the season in hardwood areas having heavy gypsy moth populations. Hardwood stands, especially those composed primarily of oak, appear essentially without foliage. Resistant hardwoods scattered throughout the stand, such as yellow-poplar or ash, exhibit normal foliage. Pine and hemlock trees

are occasionally defoliated, as well as understory hardwood seedlings and shrubs. Usually, by mid-July, most of the defoliated hardwoods will refoliate, producing leaves that are smaller than normal and light green. Defoliated pines normally produce new foliage, while hemlocks remain defoliated and die. Many hardwoods that have had two seasons of defoliation may die.

Outbreak and Possible Triggers

Gypsy moth outbreaks are cyclic, in that populations periodically build to epidemic levels and then collapse. The first outbreak in North America occurred in 1889, about 20 years after the insect was introduced into the Boston, Massachusetts area. With the exception of the advancing front of the infested area, outbreaks may vary from 5 to 7 years or longer within the infested area. On the advancing front, populations may remain at outbreak levels for longer periods. Occasionally, an area-wide population collapse will occur. A summary of gypsy moth defoliation by state from 1924 to 1988 is presented in table I-1. As indicated in the table, a record amount of defoliation was reached in 1981, when 12,872,725 acres were defoliated across the infested area of the Northeast. Populations and associated defoliation attained this level in 2 years, building from a low of 643,609 defoliated acres in 1979. After 1981, defoliation again began to decline to a low of 998,397 acres in 1984.

Many interacting factors contribute to the start of a gypsy moth outbreak in a given area. Gypsy moth outbreaks pass through four distinct phases or modes. They are:

1. Innocuous mode: Gypsy moth populations are stable at low levels. Predation by small mammals, birds, and arthropods, as well as insect parasitism, appears to play a major role in maintaining stable populations (USDA 1981; Campbell 1976).

2. Release phase: The exact causes which permit stable gypsy moth populations to begin building are not clearly understood. It is thought that populations build first in localized areas, having secure resting or hiding locations to escape enemies, adequate food and favorable climatic conditions before populations spread to adjacent areas. Favorable weather conditions, such as a mild winter followed by a warm dry spring and summer, increase larval survival and population expansion (USDA 1981; Campbell and Sloan 1977).

3. Outbreak mode: Gypsy moth populations build to high levels, and the larvae cause moderate to heavy defoliation of susceptible hosts over wide areas. Mortality caused by birds, mammals, arthropods, and parasites continue, but their impacts are minor. Toward the end of the outbreak, the gypsy moth virus (NPV) may begin to build in the population (USDA 1981; Campbell and Sloan 1977).

4. Decline phase: Gypsy moth populations begin to collapse as a result of overpopulation, characterized by gypsy moth virus, reduced production of offspring, and starvation. Parasites and predators apparently play a minor role in the decline of populations. Such populations may often be characterized as having more male than female adults (USDA 1981).

The factors that cause populations to grow from the innocuous mode to the outbreak mode are not completely known. Regional weather patterns may have a great influence on the release phase of the population. Mild winters followed by warm, dry spring periods favor survival of the overwintering egg masses and maximum survival of the early larval stages. Persistently low winter temperatures, such as -26 degrees

Table I-1.--Summary of gypsy moth-caused defoliation (in acres) by State, 1924-1988

Year (19-)	ME	NH	VT	MA	RI	CT	NY	PA	NJ	DE	MD	MI	VA	WV	DC	TOTAL
24	71	591	0	163	0	0	0	0	0	0	0	0	0	0	0	825
25	0	239	0	48,321	0	0	0	0	0	0	0	0	0	0	0	48,560
26	1	960	5	78,193	1,663	0	0	0	0	0	0	0	0	0	0	80,822
27	4,985	3,923	2	131,880	126	4	0	0	0	0	0	0	0	0	0	140,920
28	5,575	119,757	3	137,121	58	0	0	0	0	0	0	0	0	0	0	262,514
29	15,187	440,845	0	95,078	23	0	0	0	0	0	0	0	0	0	0	551,133
30	55,174	205,125	0	27,856	66	5	0	0	0	0	0	0	0	0	0	288,226
31	20,938	96,690	277	86,694	114	8	0	0	0	0	0	0	0	0	0	204,721
32	42,298	43,287	1	200,387	376	46	0	0	0	0	0	0	0	0	0	286,395
33	19,718	216,669	2	157,003	4,292	46	0	0	0	0	0	0	0	0	0	397,730
34	60,403	285,880	25	128,237	17,750	66	0	0	0	0	0	0	0	0	0	492,361
35	92,630	330,195	106	106,097	10,908	833	0	0	0	0	0	0	0	0	0	540,769
36	80,944	192,114	0	152,469	3,095	0	0	0	0	0	0	0	0	0	0	428,622
37	140,026	72,973	81	393,613	2,063	4	0	0	0	0	0	0	0	0	0	608,760
38	120,432	34,122	416	154,348	3,297	1,339	0	0	0	0	0	0	0	0	0	313,954
39	202,193	136,772	5,311	143,292	848	4,224	0	0	0	0	0	0	0	0	0	492,640
40	204,041	152,797	3,160	125,586	52	0	0	0	0	0	0	0	0	0	0	485,636
41	122,386	80,579	980	263,369	707	0	0	0	0	0	0	0	0	0	0	468,021
42	850	6,963	49	36,715	0	0	0	0	0	0	0	0	0	0	0	44,577
43	10	290	0	34,481	64	0	0	0	0	0	0	0	0	0	0	34,845
44	21,221	2,346	210	225,637	640	14	75	6	0	0	0	0	0	0	0	250,149
45	210,881	58,517	93,950	456,832	1,280	16	0	11	0	0	0	0	0	0	0	821,487
46	203,813	183,943	15,900	217,132	1,645	486	0	0	0	0	0	0	0	0	0	622,919
47	0	166	0	7,256	0	0	0	0	0	0	0	0	0	0	0	7,422
48	60	21	0	32,386	0	0	0	0	0	0	0	0	0	0	0	32,467
49	0	8	0	78,665	0	0	0	0	0	0	0	0	0	0	0	78,673
50	2	12	0	4,979	0	375	0	0	0	0	0	0	0	0	0	5,368
51	8,195	2,478	1,108	3,185	0	5,673	675	0	0	0	0	0	0	0	0	21,314
52	82,715	94,975	26,985	82,372	0	6,005	0	0	0	0	0	0	0	0	0	293,052
53	174,999	209,335	120,787	917,996	0	56,215	7,745	0	0	0	0	0	0	0	0	1,487,077
54	170,485	154,015	24,650	118,095	0	13,848	10,355	0	0	0	0	0	0	0	0	491,448
55	10,810	14,975	8,875	0	0	6,842	10,559	0	0	0	0	0	0	0	0	52,061
56	7,285	9,305	12,635	3,830	0	3,458	6,645	0	0	0	0	0	0	0	0	43,158
57	120	0	495	16	0	4,909	858	60	0	0	0	0	0	0	0	6,458
58	0	0	0	8	0	117	0	0	0	0	0	0	0	0	0	125
59	1,000	4,000	1,500	382	0	5,980	1,605	0	0	0	0	0	0	0	0	14,467
60	6,350	4,600	6,132	150	0	15,000	16,490	0	0	0	0	0	0	0	0	48,722

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Table I-1.--Summary of gypsy moth-caused defoliation (in acres) by State, 1924-1988 (continued)

Year (19-)	ME	NH	VT	MA	RI	CT	NY	PA	NJ	DE	MD	MI	VA	WV	DC	TOTAL
61	21,340	621	11,834	3,000	0	0	30,685	0	0	0	0	0	0	0	0	67,480
62	3,998	3,390	6,292	150,000	0	83,290	61,342	0	0	0	0	0	0	0	0	308,312
63	1,970	8,345	12,020	87,847	0	40,140	22,600	0	0	0	0	0	0	0	0	172,922
64	0	14,509	23,523	20,787	375	98,552	97,237	0	0	0	0	0	0	0	0	254,983
65	190	8,451	2,903	17,232	50	86,009	148,366	0	0	0	0	0	0	0	0	263,201
66	30	20	650	500	110	15,895	34,655	0	5	0	0	0	0	0	0	51,865
67	825	561	2	909	150	2,731	46,160	0	1035	0	0	0	0	0	0	52,373
68	777	5,830	0	3,925	565	16,416	47,525	60	5,025	0	0	0	0	0	0	80,123
69	1,450	17,160	0	6,060	313	56,881	121,610	830	51,525	0	0	0	0	0	0	255,829
70	1,080	38,525	0	6,835	1,082	368,706	416,270	10,500	129,835	0	0	0	0	0	0	972,833
71	820	3,250	790	18,787	8,525	655,107	479,150	598,200	180,595	0	0	0	0	0	0	1,945,224
72	40	200	4,215	20,480	22,510	513,880	177,605	404,060	226,140	0	0	0	0	0	0	1,369,130
73	490	30	200	43,970	35,925	333,215	248,441	856,710	254,865	0	0	0	0	0	0	1,773,846
74	860	0	0	76,903	2,120	120,980	42,350	479,590	28,102	0	0	0	0	0	0	750,905
75	110	0	15	17,895	435	63,411	9,275	317,880	55,430	0	0	0	0	0	0	464,451
76	0	0	1,750	29,820	7,540	9,809	26,583	732,310	57,630	0	0	0	0	0	0	865,442
77	2,010	320	33,435	133,081	125	0	91,313	1,296,550	39,185	0	0	0	0	0	0	1,596,019
78	4,120	725	29,756	63,042	0	3,835	500,046	452,892	204,830	0	0	0	0	0	0	1,259,246
79	23,180	5,980	15,411	226,260	655	7,486	162,275	8,552	193,700	10	0	100	0	0	0	643,609
80	221,220	183,999	75,094	907,075	43,830	272,213	2,449,475	440,500	411,975	0	3	5	0	0	0	5,005,389
81	655,841	1,947,236	48,979	2,826,095	272,556	1,482,216	2,303,915	2,527,753	798,790	500	8,826	18	0	0	0	12,872,725
82	574,537	878,273	9,864	1,383,265	658,000	803,802	825,629	2,351,317	675,985	1,265	9,162	92	0	0	0	8,171,191
83	16,285	560	0	148,133	53,880	153,239	290,843	1,360,824	340,285	2,992	15,870	457	0	0	0	2,383,368
84	1,892	0	0	185,520	164,600	544	33,678	450,642	98,695	14,203	41,824	6,425	374	0	0	998,397
85	6,698	0	0	414,084	133,920	89,544	129,820	581,113	239,350	5,144	83,488	18,460	5,200	2,470	0	1,709,291
86	11,572	0	0	343,091	219,150	237,237	175,365	987,819	280,290	3,118	58,190	61,370	27,259	8,250	0	2,412,711
87	648	290	0	28,739	5,050	65,364	55,150	880,335	95,104	2,530	76,803	39,443	67,695	12,490	12	1,329,653
88	100	1,015	703	0	725	1,639	15,700	312,092	7,430	791	58,507	70,350	191,000	59,250	0	719,302
Total:	3,637,881	6,278,757	601,081	11,813,159	1,681,258	5,707,654	9,098,070	15,050,606	4,375,806	30,553	352,673	196,720	291,528	82,460	12	59,198,218

Fahrenheit for 48 to 72 continuous hours, may cause heavy egg mortality (McManus 1980; USDA 1981). This is especially true if most of the egg masses are exposed or not covered by snow. Similar egg mortality may result when unseasonably warm days occur in the winter (70+ degrees Fahrenheit) and then are followed by an intense cold period. The larvae resume development within the eggs during the warm period and then are frozen by the following cold period. Weather conditions in the spring also influence the survival and development of larvae. Heavy larval mortality may occur when early instar larvae are subjected to extreme cold periods shortly after egg hatch. Larval development may also be slowed by periods of cool, wet weather that may occur in the spring. If these conditions delay bud break and leaf expansion on host trees, many of the larvae may starve. Unsuitable site and forest stand conditions may further limit population development, while stands that are composed primarily of preferred host species favor population development.

When the gypsy moth was introduced into this country from Europe in 1869, its complement of natural enemies was not included. Early in this century, efforts were made to introduce and establish parasites and predators from Europe and Asia. The native parasites and predators, together with those that were successfully introduced, are thought to be important in keeping gypsy moth populations at low levels between outbreaks. Parasites and predators, however, probably have little impact on populations in the outbreak mode (McManus 1980). In addition to the insect parasites and predators, birds, mammals, amphibians, reptiles, and invertebrates take their toll on the gypsy moth. About 38 or more species of birds feed on various stages of the gypsy moth. Similarly, 15 or more species of forest mammals include the gypsy moth in their diet.

Several natural diseases caused by viruses, bacteria, fungi, and microsporidia attack the gypsy moth. When populations are at outbreak levels, the most significant natural agent is the nucleopolyhedrosis virus (NPV), which may build up and initiate a total collapse of outbreak populations in a given area. Because of its effectiveness, it has been produced in the laboratory and developed into a biological insecticide, called Gypchek and registered with the Environmental Protection Agency (EPA).

Host Vegetation

Gypsy moth larvae can feed on at least 500 species of trees, shrubs, and vines commonly found in the eastern United States. Preferred hosts are oak species. Additional hosts include apple, basswood, gray and river birch, sweetgum, hawthorne, aspen, beech, and willow. Less desired but still attacked are black birch, yellow birch, paper birch, cherry, cottonwood, elm, sassafras, spruce, and pine. Older gypsy moth larvae feed on the foliage of several species that younger larvae normally avoid, particularly hemlock, pine, and spruce. The gypsy moth avoids ash, balsam fir, butternut, black walnut, catalpa, red cedar, flowering dogwood, American holly, locust, sycamore, yellow poplar, and shrubs such as native laurel, rhododendron and arborvitae. During outbreaks, however, gypsy moths will feed on almost all vegetation (McManus 1980).

The impact of gypsy moth defoliation on a forest stand depends upon the abundance of host trees and on site and stand conditions. Throughout the infested Northeast, the insect prefers to feed on oaks. Vigorous oaks and other hardwoods can normally withstand one or two consecutive defoliations, but suppressed trees and those in poor condition may die after one defoliation. When susceptible oak or other hardwoods are stripped of more than 50 percent of their leaves, the tree usually refoliates by mid-summer. Production of new foliage puts additional stress on the tree, further depleting its stored food reserves. Previously stressed trees or those weakened by

other agents may have insufficient food reserves to completely refoliate, and many of the upper crown branches die. Defoliation during periods of drought intensifies the stress, often resulting in extensive tree mortality. Weakened trees are usually attacked and killed by opportunistic organisms, such as the shoestring fungus (Armillaria mellea) and the two-lined chestnut borer (Agrilus bilineatus) (McManus 1980; Wargo 1977). Depending on its intensity, defoliation may also reduce the trees' growth by 30 to 60 percent. If gypsy moth populations collapse and no defoliation occurs in the following 1 or 2 years, most stressed trees will survive and regain their former growth rates.

Mortality of overstory hardwoods may result in changes in stand composition, depending on the site. Such mortality may encourage red maple, yellow poplar, white pine or other species to proliferate in such areas. In some cases, the changes in stand composition may be regarded as beneficial, since such areas may become less susceptible to future gypsy moth defoliation. These new stands may, however, be less valuable for wildlife and for timber production.

CURRENT SITUATION

Current Programs

USDA Forest Service Suppression - The Cooperative Forestry Assistance Act of 1978 (P.L. 95-313) provides authority for State/Federal cooperation in forest insect and disease management. The Secretary of Agriculture is authorized to assist in the control of pest outbreaks on non-Federal forest lands of all ownerships. A principal USDA goal is to assure an adequate supply of high-quality food and fiber and a good environment for the American people. The USDA gives special emphasis to the development and use of efficient and environmentally acceptable integrated pest management (IPM) programs. All methods, including the use of chemical pesticides, are considered in IPM projects.

Forest Service policy is to protect and preserve the forest resources of the Nation against destructive insect and disease pests. Pest outbreaks are prevented or suppressed by methods that will restore, maintain, and enhance the quality of the environment. These objectives are attained on non-Federal lands through cooperation with State Foresters or equivalent State officials. Pests are suppressed directly on National Forest System lands and in cooperation with responsible officials on other Federal lands.

Projects approved for cooperative financing must meet Forest Service standards for environmental, biological, and economic acceptability and the Federal role criteria (Forest Service Manual, Title 3400). Approval is based on the results of an environmental analysis conducted in accordance with NEPA and its implementing regulations.

The USDA Forest Service began cost sharing cooperative State gypsy moth suppression projects in 1974. These projects are aimed at meeting the short-range objectives of suppressing moderate to high-level gypsy moth populations and at preventing excessive defoliation and tree mortality in forested residential areas, State or municipal parks or high-value forest stands. Such projects are not aimed at treating low level populations to reduce the spread of the gypsy moth into new areas. Private landowners, towns or communities have the option of not participating in cooperative State suppression projects. No attempt is made to eradicate the insect or treat all of the infested areas (USDA FEIS 1985a). In general, cooperative State/Federal suppression has been very successful in meeting project objectives aimed at reducing high gypsy moth populations, minimizing defoliation and preventing tree mortality in

forested residential areas, State or municipal parks, recreation areas and high value forest stands. Without the success of the cooperative suppression programs initiated by the USDA Forest Service in 1974, the total amount of annual defoliation recorded in table I-1 would have been much larger.

Although the AIPM Program does not preclude the possibility of cooperative projects occurring within the AIPM Project Area under the current cooperative suppression program, they are not likely to occur because State and local governments (city and county) are required to contribute up to 50% of the treatment costs. AIPM will provide 100% funding. Action proposed in the AIPM Area under the cooperative program is beyond the scope of this EIS. Appropriate NEPA documentation will be prepared for cooperative funded projects and tiered to the 1985 Gypsy Moth Suppression and Eradication Project EIS (USDA FEIS, 1985a). If a cooperative gypsy moth suppression project is considered within the AIPM Project Area, the AIPM Project Manager will coordinate with the responsible officials of the cooperative project. Coordination with these activities, if they occur, will help maintain the integrity of the AIPM Project so valid conclusions can be drawn regarding methods improvement work and overall success or failure of the AIPM Project or aspects thereof. It is also necessary so the potential Project-wide or cumulative environmental impacts of gypsy moth management actions proposed under AIPM and those proposed under the cooperative programs can be evaluated. AIPM Projects may be modified or deferred to minimize or reduce the overall potential environmental impacts.

USDA Animal and Plant Health Inspection Service (APHIS) Eradication and Regulatory Programs - APHIS has the responsibility and authority to conduct programs against the gypsy moth throughout the United States. The agency authority is derived from the Plant Quarantine Act of 1912 as amended (7 USC 151-165, and 167); The Federal Plant Protection Act of 1957 (7 USC 150aa-150jj); and the cooperation with States in administration and enforcement of certain Federal laws approved September 2, 1963 (7 USC 450). These acts authorize, among other things, the development of APHIS activities for the regulation of the artificial spread of the gypsy moth from the quarantined areas, and the eradication of isolation gypsy moth infestations outside this area.

The goal of the APHIS Cooperative Regulation Program is two-fold: to retard or prevent the artificial (man caused), long distance spread of the gypsy moth and to eradicate detected isolated infestations. To control the moth's spread, regulations are enforced on area-to-area movement of articles that might contain eggs, larvae, pupae or adults. APHIS is also charged with detection and eradication of infestations, subsequently established as a result of the artificial movement of gypsy moth from area to area. Gypsy moth surveys provide information about pest distribution that serves to guide both regulatory and eradication activities (USDA FEIS 1985a).

As a general rule, Federal participation in eradication projects will only occur when gypsy moth populations are identified that are: (1) geographically separate from areas known to be generally infested; (2) the result of artificial spread as opposed to natural spread; and (3) well defined by delimiting traps (USDA FEIS 1985a). In contrast to cooperative suppression projects, APHIS cooperative eradication projects attempt to treat all of the infestation in a given area and provide private landowners no option for non-participation. In general, APHIS eradication projects have been very successful in eradicating artificially introduced gypsy moth populations detected beyond the generally infested area of the northeastern United States (Appendix E, History of Gypsy Moth Eradication, USDA FEIS 1985a). Without the success of the cooperative APHIS projects, gypsy moth populations in many currently uninfested States would undoubtedly be well established and creating major impacts in

forest and residential environments. In addition, new artificial introductions into areas beyond the generally infested northeastern United States have been greatly reduced by the regulatory activities of APHIS. These regulatory activities are aimed at preventing artificial spread of the gypsy moth on infested materials (outdoor household goods, lumber, nursery stock, military equipment, etc.) shipped from infested states into uninfested areas of the United States.

Obviously, some components or concepts of both the Forest Service cooperative State suppression program and APHIS cooperative eradication and regulatory programs will be incorporated into the AIPM Project. However, the primary differences between these programs and the AIPM Project are: The AIPM Project is not a cost/share program; both high and low gypsy moth populations are subject to intervention action; both high and low value areas may receive intervention action; some regulatory-type intervention may be conducted to prevent artificial spread of the gypsy moth; no eradication of low level populations will be attempted per se; intervention in low level populations will be attempted to prevent population buildup.

As with the Forest Service cooperative suppression program, treatment of gypsy moth populations under the APHIS cooperative eradication and regulatory programs can occur within the Project Area. However, like the cooperative suppression program, treatment in the AIPM Project Area under the APHIS programs is not anticipated as it too only shares the cost of treatment, while funding is provided in full by AIPM. Actions proposed under the APHIS cooperative eradication and regulatory programs are beyond the scope of this EIS. Actions and subsequent NEPA documentation for those proposed actions will not be subject to the procedures and guidelines described in this EIS nor will this EIS be used to tier future NEPA documentation for action under APHIS programs. NEPA documentation for actions under APHIS programs is required and will also be tiered to the 1985 <u>Gypsy Moth Suppression and Eradication Project</u> (USDA FEIS, 1985). If and APHIS cooperative eradication and regulatory program is planned within the AIPM Project Area, the AIPM Project Manager will coordinate AIPM activities with APHIS to maintain the integrity of the AIPM Project and to assess the potential Project-wide or cumulative environmental impacts of all gypsy moth management work within the AIPM Project boundaries. Projects proposed by AIPM may be modified or deferred to minimize or reduce the overall potential environmental impacts.

Appropriate intervention tactics may occur under these existing programs in the Project Area whether or not the AIPM Project is implemented.

<u>Status of Gypsy Moth Populations</u>

In 1988, gypsy moth defoliation in the Northeast totaled 719,302 acres, down from a total of 1,329,653 acres in 1987. It is unknown if the indicated downward trend will continue through 1989 (table I-1). While populations have declined within the generally infested area, defoliation continues to increase along the advancing front of the infestation in central Maryland, western Pennsylvania, northern Virginia and northeastern West Virginia.

The gypsy moth continues to spread into uninfested areas along the advancing front, even though State/Federal suppression projects have been conducted in or adjacent to these areas. Natural spread continues because current cooperative suppression normally provides for treatment of areas having high populations (more than 250 egg masses/acre). Treatment areas are generally forested residential and suburban communities, recreation areas, parks or high-value forest stands. Areas that do not meet the above criteria remain untreated. Because much of the infestation in any given State remains untreated, the natural spread of the insect continues unimpeded.

This is currently the situation adjacent to the northern boundary of the AIPM Project Area.

SCOPING

Process

The scoping process is used to determine the significant issues, concerns, and opportunities to be analyzed. The process began with a decision by the Forest Service to prepare the EIS. A "Notice of Intent" to prepare an environmental impact statement was published in the Federal Register on March 10, 1988. A scoping letter was prepared by the EIS Team in March 1988 which described the origin, location, and objectives of the AIPM Gypsy Moth Demonstration Project. The scoping letter requested public input on relevant issues, concerns, or opportunities related to the proposed AIPM Project. The letter was sent to Federal, State and local agencies, conservation and environmental groups, and interested and affected individuals located in and around the proposed Project Area in Virginia and West Virginia. Addresses on land management planning mailing lists from the George Washington, Jefferson and Monongahela National Forests and a mailing list from the Shenandoah National Park were used. More than 3,000 letters were mailed on March 18, 1988.

In addition, a news release was provided to newspapers in and around the Project Area. The news release discussed the AIPM Project and provided information similar to the scoping letter. All individuals who submitted issues to be considered in the analyses were placed on the mailing list to receive additional information, including the draft EIS, final EIS, and Record of Decision.

A total of 314 responses was received. Public issues, management concerns, and opportunities (comments that offered solutions or possible action) were identified and reviewed by the AIPM Gypsy Moth EIS Team. A second interdisciplinary team of Forest Service specialists reviewed the public responses to the scoping letter to identify issues, concerns, and opportunities to ensure that all significant issues were identified. Both sets of issues, concerns, and opportunities were blended into similar topic areas to create major issue statements. The major issue statements are composed of smaller issues that incorporate what the public, State, and Federal agencies wrote about the topic.

Major Issue Statements

1. Impacts of Treatment to nontarget Organisms. There is concern that intervention activities proposed by the AIPM Gypsy Moth Demonstration Project could have adverse impacts on nontarget organisms. In this project, living organisms, other than gypsy moth, such as threatened and endangered species, Lepidoptera species, wildlife and game species, are considered as potential nontarget organisms. Many public comments addressed concern for potential adverse impacts to water quality, particularly regarding biological or chemical insecticide applications. This concern was for organisms dependent upon water sources that could be impacted, such as fish, wildlife, and aquatic insects. Comments concerning water quality have been interpreted to mean concern for nontarget organisms.

2. Impacts of Gypsy Moth Infestation. There is concern about the potential impacts of gypsy moth infestation spreading through the Appalachian Mountains. Comments were received indicating a fear that gypsy moth infestations would result in catastrophic environmental impacts. The public questioned how these impacts might be minimized. Other comments indicated

that the threat of gypsy moth infestation impacts are overestimated, and, since we cannot eradicate the pest, why go to the expense of treating or suppressing it?

3. Impacts on Special Management Areas. Concerns about impacts to special management areas such as wilderness and designated natural areas, threatened and endangered species habitat, park lands, research natural areas, and private land were received.

4. Effectiveness of Intervention Tactics. The effectiveness of proposed intervention tactics is also a concern to total success of the Project. Comments were received that indicate a need to treat all lands in the Project Area, and these comments questioned the voluntary aspects of the program where landowners and managers can decline to participate in intervention tactics which could possibly affect the success of the program. Coordination of the various agencies involved and the proper application of various intervention tactics were also commented on as being necessary for effective gypsy moth management. Comments were received for increased research regarding non-traditional management tactics due to a concern that gypsy moth might become resistant to existing chemical insecticides registered by EPA for gypsy moth control.

5. Impacts to Human Health. There is concern that intervention activities (primarily the use of chemical insecticides) could have adverse impacts to humans. Comments addressed health hazards related to contamination of ground water and drinking water, food supplies (edible wild plants and animals as well as domestic ones), and general risk to humans. A few specific comments were received questioning the possible carcinogenic effects from the use of chemical insecticides.

A need to initiate an information and education program throughout the AIPM Project Area was identified. A number of comments raised the concern that the program and how it differs from existing suppression and eradication programs is not fully understood by the public . There is a certain amount of public apprehension about proposed intervention tactics within the AIPM area which needs to be addressed. A concern that small, private landowners be able to participate in the proposed program also surfaced.

Steps have been taken to enhance public awareness of the Project and Project activities. A full time Public Affairs Specialist has been hired to coordinate all public affairs activities. In addition, an Information Team has been appointed, consisting of the Public Affairs Specialists from the George Washington, Jefferson and Monongahela National Forests, the Shenandoah National Park and the Extension Services of Virginia and West Virginia. These individuals will conduct the public affairs and public involvement activities in their own local areas. Project information will be available through all these sources and will include such items as news releases, flyers, audio/visual packages and the availability of speakers for schools, groups and clubs. As a part of public involvement in the development of the NEPA documentation for this project, public meetings and forums will be arranged and conducted.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Gypsy moth larvae hatching in the spring

CHAPTER II

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Research

Development

Basic steps of integrated pest management

Application

INTRODUCTION

This chapter provides a description of the survey and monitoring process and descriptions of the various intervention tactics that could be used under the alternatives. It also briefly describes alternatives that were considered but eliminated from detailed study. The alternatives considered in detail are described, and a comparison of alternatives is presented. The process for implementing the selected alternative and mitigating measures that will minimize the potential impacts of these alternatives are described.

SURVEY AND MONITORING OF GYPSY MOTH POPULATIONS

A key component of IPM is pest population monitoring. In 1988 the AIPM Project Area was overlaid with a 1-kilometer (km) grid established on Universal Transverse Mercator (UTM) coordinates. A monitoring system has been established at 3km intervals along this grid in West Virginia and at 2km intervals in Virginia. Monitoring points, established near intersections of grid lines, will have a milk carton pheromone trap attached to a tree to trap male moths. At a subset of points, stand conditions will be recorded and evaluated to determine susceptibility to defoliation (Valentine and Houston 1984), as well as potential tree mortality during a gypsy moth outbreak, using a hazard rating system developed by Herrick and Gansner in 1986. Monitoring between 2 or 3km grid points may be more intensive (e.g. 1km intervals) on a site-specific basis, depending on land use and cover types. The monitoring system is designed to provide detailed information about gypsy moth populations within the Project Area. Figure II-1 displays approximate area within the AIPM Project where multiple male gypsy moths were trapped in 1988.

During the fall and winter, egg mass samples will be taken in 1km grid cells which lie within areas having greater than 200 male moths captured in pheromone traps. Within each cell, egg mass samples will be taken on a transect. Once the transect has been defined, a 5-minute walk sample will be taken and the number of egg masses observed during the walk will be recorded. At the end of the walk, a 40th acre fixed radius egg mass sample will be taken. The same transect will then be followed for another 5 minutes without recording egg mass numbers. At the end of 5 minutes, another 5-minute walk with counts and a fixed radius plot sample will be taken. A minimum of 3 pairs of timed walks and fixed radius egg mass samples will be taken in each 1km cell. This information will be used to estimate egg-mass densities and delineate boundaries of potential problem areas. Field crews will collect representative numbers of egg masses from infested areas in late winter for laboratory analysis. The analysis will determine the number of eggs/mass, percent-viable eggs/mass and the percent of eggs parasitized/mass. This analysis will provide information on the quality of the population. This information, along with the monitoring data, will be used to help determine if intervention is appropriate and if so, what intervention tactic or tactics may be employed. Data to be collected will include:

- Egg mass density and quality
- Male moth captures
- Population trends (egg mass, male moth)
- Parasite and disease incidence
- Defoliation estimates
- Size of infestation
- Proximity to other infested areas
- Stand susceptibility to defoliation
- Hazard rating
- Environmental sensitivity
- Vegetative cover type
- Land-use category

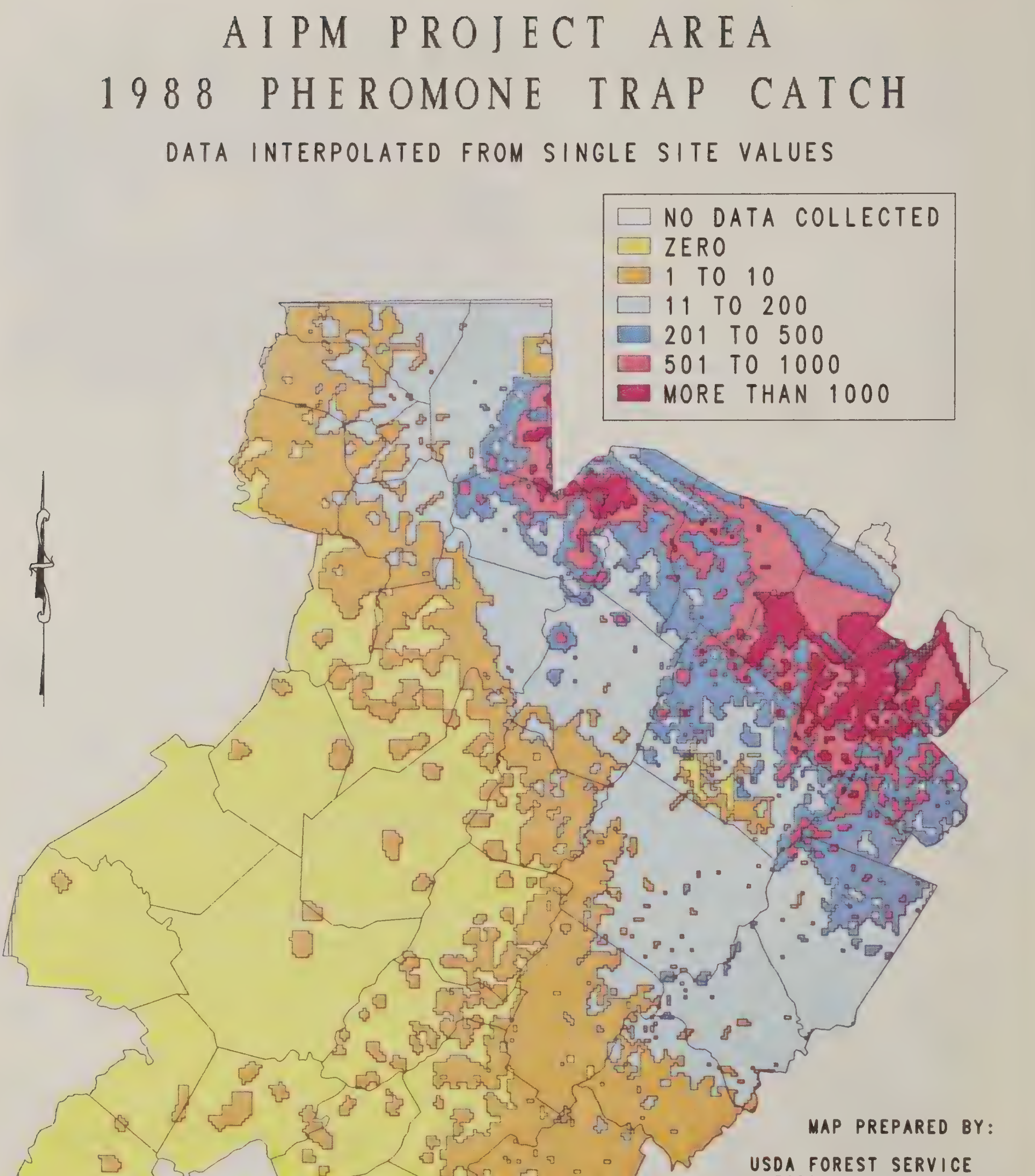

FIGURE II-1.-COUNTIES IN THE AIPM PROJECT AREA WHERE MULTIPLE MALE GYPSY MOTHS WERE TRAPPED IN 1988.

DESCRIPTION OF INTERVENTION TACTICS CONSIDERED IN ALTERNATIVES

Disparlure

Considered a gypsy moth specific intervention tactic, this is a synthetic formulation of the female gypsy moth sex attractant pheromone. The formulation, called disparlure, is used in two forms. The first is a laminated polymeric dispenser, or tape, for slow release of the attractant. It is manually attached to trees in a grid pattern, generally in small areas with low-level populations. The second form of disparlure is a commercial product consisting of fine (about 0.1" long) polymeric flakes impregnated with the gypsy moth pheromone. Normal use involves the aerial application of the material over large areas. These products are used to disrupt mating communications between the sexes and may be used alone or in combination with an earlier application of an insecticide. Both disparlure products are normally used in areas where there are 1 to 10 gypsy moth egg masses per acre. Organisms other than gypsy moth are not affected by this tactic.

Release of Sterile Life Stages

This tactic involves two methods of releasing sterile life stages of gypsy moth to mate with native gypsy moth populations to produce sterile egg masses. These methods are:

1. Sterile male moth release, and

2. Inherited sterility

The sterile male moth technique involves the ground release of male gypsy moths that have become sterile through irradiation methods in the laboratory. The moths once released, mate with native female gypsy moths. After mating with the sterile male moths, the native female gypsy moths will produce sterile eggs that will not hatch the following spring.

The second method involves mating irradiated male moths with normal females in the laboratory. The resultant egg masses are then introduced into areas having light populations, using ground or aerial application methods. Eggs hatch in the spring, larvae (male and female) feed on available foliage, pupate and emerge as adult moths. These moths (male and female) mate with the native gypsy moth population, producing sterile eggs that will not hatch. Both tactics are normally used when there are from 1 to 10 gypsy moth egg masses per acre. Organisms other than gypsy moth are not affected by this tactic.

Mass Trapping

This tactic involves the use of large-capacity traps (resembling a half-gallon milk carton) baited with the female gypsy moth sex-attractant pheromone. Traps are placed in an intensive grid pattern to capture male moths before they mate with females. It may also be used in combination with earlier applications of an insecticide. This tactic can be used in small areas when there are 1 to 10 gypsy moth egg masses per acre. Organisms other than gypsy moth are not affected by this tactic.

Insecticides

Three insecticides, the gypsy moth nucleopolyhedrosis virus (NPV), *Bacillus thuringiensis* (*Bt*), and diflubenzuron, are considered for use on suppressing gypsy

moth populations. Insecticides are applied to treatment areas after caterpillars hatch from eggs in the spring. Application is made as foliage expands but before leaves reach full size and generally occurs after gypsy moth larvae have dispersed on the wind as early stage larvae. Since the timing of application is dependent on leaf development and larval development, some gypsy moth larvae may disperse beyond the treatment area. Our ability to reduce this spread through other intervention activities requires an understanding of this process and implementation of selected activities in locations predicted to receive this spread.

Nucleopolyhedrosis Virus (NPV)

The nucleopolyhedrosis virus is a naturally-occurring virus that causes a disease (often referred to as "wilt" disease) of the gypsy moth. Currently, a formulation of NPV called "Gypchek" is produced in limited quantities by the USDA Forest Service. The gypsy moth NPV (Gypchek) was registered by the US Environmental Protection Agency (EPA) in 1978 for aerial application to suppress gypsy moth populations. The insecticide is prepared from gypsy moth larvae that have been inoculated and killed by NPV. The active ingredient in the gypsy moth NPV formulation is the virus, which is imbedded in a protein particle called the polyhedron. The powder formulation contains the virus and a small amount of insect parts (Podgwaite and others, 1983).

The effectiveness of the gypsy moth NPV, like most biological insecticides, is dependent upon proper application and timing. The efficacy of the NPV formulation is also more dependent upon weather conditions, especially rain and ultraviolet light, than chemical insecticides. The gypsy moth NPV formulations should be applied when the larvae are small (first and second instar) and foliage expansion on susceptible host trees is from 10 to 50 percent. Since the gypsy moth NPV formulation is a stomach insecticide, the larvae must ingest the virus along with the foliage. After ingestion, the virus is liberated from the polyhedra and attacks internal tissues and organs, multiplying rapidly and causing disintegration and death. This process, depending on temperature, generally takes 10 to 14 days. In general, the virus works best in moderate to heavy gypsy moth populations. Operationally, two applications of the virus are currently used; they are applied 7 to 10 days apart for maximum effectiveness. Generally, NPV is applied to gypsy moth populations of greater than 250 egg masses per acre.

The gypsy moth NPV formulation can be used as an intervention tactic by itself, or in combination with other techniques, such as later applications of disparlure. Organisms other than gypsy moth are not affected by the tactic.

Bacillus thuringiensis (Bt)

Bacillus thuringiensis, commonly known as Bt, is a naturally-occurring, spore-forming, crystal-producing, rod-shaped bacterium. There are numerous varieties of Bt; however, the variety that is registered for the control of various agricultural and forest Lepidoptera, including the gypsy moth is Bacillus thuringiensis Berliner, variety Kurstaki, strain HD-1. Another strain of Kurstaki, called NRD-12, has been developed and registered for use against the gypsy moth. In lab tests, this strain seems to be more effective against this insect that the HD-1 strain. Neither the HD-1 nor NRD-12 strains of Bt are known to have any effect on aquatic diptera. However, a different variety of Bt, called Israeliensis, is registered for use in the control of mosquito and black fly larvae. This material will not be used as an intervention tactic for gypsy moth in the AIPM Project. When these strains begin to form spores, they produce protein crystalline bodies that contain delta-endotoxin, a natural substance that is toxic to Lepidopterous insects. Commercial formulations of Bt contain the spores and crystals as their primary

ingredients. When ingested by larvae, the crystals dissolve in the alkaline gut, releasing the toxic protein. The protein breaks down the lining of the gut, causing the insect to cease feeding. The bacterium then invades the internal tissues of the larvae, multiplies rapidly and causes organ disintegration. Death of the larva is caused by a combination of bacterial infection and starvation, usually within 7 to 10 days (USDA FEIS 1985; Dubois and Lewis 1981).

The effectiveness of Bt is also dependent upon proper application and timing as well as weather conditions. It may be applied from the ground or air at various rates in light or moderate gypsy moth populations. Generally, Bt should be applied when the majority of the larvae are in the first and second instar and leaf expansion on susceptible host trees is 30 to 50 percent. In moderate gypsy moth populations, two applications may be needed to reduce larval populations and prevent defoliation. Bt may be used as an intervention tactic by itself or in combination with other techniques, such as later applications of disparlure or release of parasites. Nontarget Lepidopterous (moths and butterflies) insects may be impacted by this tactic if actively feeding in the treated area within 14 days after application. Additional information on both NPV and Bt is presented in "Gypsy Moth Suppression and Eradication Projects"; FEIS 1985. Generally, Bt populations are made to areas having more than 250 egg masses per acre.

Diflubenzuron

Diflubenzuron is a benzoylphenylurea-based chemical insecticide manufactured and sold under the trade name Dimilin. It is a synthetic growth regulator which interferes with the formation and deposition of the endocuticle during molting. When ingested by gypsy moth larvae, diflubenzuron interferes with chitin synthesis causing the body wall of the larva to rupture during the molting phase. Diflubenzuron also exhibits some contact insecticidal properties against the gypsy moth. Diflubenzuron is effective against the gypsy moth at very low concentrations, on the order of 0.5 to 1 ounce of active ingredient per acre. Upon ingestion, diflubenzuron is lethal to any stage of gypsy moth larvae.

Diflubenzuron may be applied by ground or aerial application methods to achieve population reduction and foliage protection in light to heavy gypsy moth populations. Generally, diflubenzuron is used against gypsy moth populations greater than 250 egg masses per acre. Application of diflubenzuron is made when the majority of the gypsy moth larvae are in the first to third instar and forest foliage is 10 to 30 percent expanded. Late egg hatch or slow larval development may require adjustments in application timing. The insecticide may be used alone or in combination with other intervention components, such as later applications of disparlure.

Fate in the Environment - Diflubenzuron is rapidly degraded in about 3 to 4 days by microbial activity once it gets into the soil. The persistence of diflubenzuron in the environment depends upon which substrate is being investigated (soil, water, sediments, litter or foliage), the particle size of the active ingredient (measured in microns) and several environmental factors (temperature, microbial activity, pH and amount of suspended organic matter in water [Willcox and Coffey 1978]). With this numer of variables, it is logical to conclude that there would be a different half life for diflubenzuron in different situations. Laboratory experiments indicate the half life of diflubenzuron formulations (particle size of two microns) to be 3 to 7 days in soil and 1 to 2 days in water (Willcox and Coffey 1978; Chapman, et al 1985). Not all water is the same, however, diflubenzuron degrades rapidly (<3 to 7 days) in neutral or alkaline waters but has potential for persistence or accumulation in highly acidic conditions (pH $\leq$ 4.0) where degradation was not observed after 56

days (Ivie et al 1980). Field tests indicate the half life to be 1-4 days in soil and <24 hours in water (Willcox and Coffey 1978).

Diflubenzuron is quite stable on leaf surfaces with as much as 90% remaining 30-60 days after treatment (Willcox and Coffey 1978), 20% remaining on pine needles after 62 days (Mutanen et al 1988) and 25% of the original residue remaining on hardwood leaves, pine needles and rhododendron leaves 63 days after treatment (Van Den Berg 1986).

Toxicology - The effects of diflubenzuron on nontarget organisms has been studied by treating several different forest ecosystems with the chemical at rates from 0.5 to 1 ounce active ingredient per acre. Following application, soil microbes and invertebrates, terrestrial and aquatic insects, fish, small mammals, and birds were monitored for any effects from the treatment. No treatment-related effects were observed on soil organisms, terrestrial insects (including honeybees), mammals, or birds (USDA FEIS, 1985; Willcox and Coffey, 1978). Other studies were conducted in aquatic habitats to determine the effect of diflubenzuron on aquatic insects and nontarget crustaceans. Diflubenzuron has been found to reduce populations of certain sensitive nontarget species, such as water fleas, cyclops and immature copepods, mayflies, and diving bugs (USDA FEIS, 1985; Willcox and Coffey, 1978). The overall environmental impact is limited because of the short-lived persistence of the chemical and the recovery of affected populations within 14 to 28 days in most cases (USDA FEIS, 1985; Willcox and Coffey, 1978).

"Field experiments on soil organisms showed that diflubenzuron, administered at the excessively high rate of 2.24 Kg a.i./hectare, caused no observable effects on earthworms, mites, millipedes and centipedes. Populations of springtails decreased, but the effects had largely disappeared within four months. Breakdown of organic matter was not affected." Also, "The impact of Dimilin on components of forest ecosystems was studied in different types of forests. Springtails and mites in soil were incidentally affected, but whenever populations showed a decrease in numbers, the populations were restored for the greater part within 60 days." (Technical Information Bulletin, 9th Edition by Duphar, B. V.).

The very low toxicity of diflubenzuron for all organisms other than some insects and crustaceans is due to its mode of action of inhibiting chitin synthesis (Willcox and Coffey, 1978). Mammals, birds, fish, reptiles, and humans are unaffected by diflubenzuron. Diflubenzuron is safe for use around beneficial parasites and predators of the gypsy moth as well as honeybees. Since many beneficial insects are adults at the time of application, they are not affected by diflubenzuron (Willcox and Coffey, 1978). Chitin-producing organisms present in the aquatic ecosystem and in soil during treatment may be affected, but the effects will be temporary because of the rapid degradation of the active ingredient by micro-organisms present in both water and soil (Willcox and Coffey, 1978).

Some nontarget molting insects, especially canopy feeding macrolepidoptera and non-lepidopteran mandibulate herbivores insects, may be impacted if this tactic is used. Sucking herbivorous insects, microlepidoptera, and predaceous insects would be less affected (Martinat and others 1988).

Parasites and Invertebrate Predators

Parasites and invertebrate predators may be introduced into the AIPM Project Area as an intervention tactic using two approaches, classical biological control and augmentation (table II-1.). Classical biological control is the importation and

attempted establishment of exotic species. Augmentation is the manipulation of numbers of established or native species to maximize their effectiveness.

Since most of the established arthropod predators and parasites will move along with gypsy moth populations that spread into the AIPM Project Area, there may be little need to augment their numbers in most areas. Some parasites affect only gypsy moth or are gypsy moth specific, while other parasites and predaceous insects affect insects other than gypsy moth (table II-1).

Silvicultural

Research work is currently under way on the development of silvicultural prescriptions that may minimize the impacts caused by the gypsy moth to eastern hardwood forests. Silvicultural prescriptions have been developed for preoutbreak, outbreak and postoutbreak situations. Preoutbreak prescriptions focus on reducing stand susceptibility and vulnerability by increasing stand vigor, removing trees most likely to die, reducing gypsy moth habitat, reducing preferred food sources, improving predator and parasite habitats, and regenerating stands close to maturity. Regeneration cuttings prior to heavy gypsy moth defoliation preserve seed production, establish advanced regeneration, and enhance stump sprouting potential. Outbreak prescriptions are aimed at prioritizing stands for possible insect suppression action and regeneration of those close to maturity or understocked. Postoutbreak recommendations involve the rapid salvage of dead trees, and regeneration of stands that are predicted to incur heavy mortality (K. W. Gottschalk 1987, 1988). Research studies incorporating these prescriptions have been established in hardwood stands in central Pennsylvania and West Virginia to determine their feasibility and effectiveness in reducing or minimizing gypsy moth impacts. Because these studies are ongoing and final results are not available, silvicultural prescriptions will not be incorporated into the alternatives of this EIS. However, several demonstration areas within the AIPM Project Area may be established if research results are favorable.

COMPARISON OF DIFLUBENZURON, *Bacillus thuringiensis*, NPV EFFECTIVENESS

Diflubenzuron is lethal to gypsy moth larvae of any size. The insecticide must be ingested. Although there is some contact action, insects continue to feed until the next molt before dying. *Bt* and NPV must also be ingested by the gypsy moth larvae, which continue to feed for a short period of time before dying. *Bt* and NPV are much more effective at the dosages applied against smaller, younger larvae (first to third instar) than larger, older larvae (fourth instar and beyond).

Diflubenzuron is tightly held on hardwood foliage and residual amounts can be detected on foliage up to 60 days. The effectiveness of *Bt* and NPV from one application is relatively short, 7 to 10 days for *Bt*, slightly less for NPV. However, two applications of NPV are currently applied.

Most state cooperative suppression projects have been using the two insecticides since 1981. Generally, diflubenzuron has been applied to commercial forest land and *Bt* to the more sensitive areas, such as along major streams and lakes, recreation areas, parks or residential areas. This type of use is also a function of cost. Generally, diflubenzuron is significantly cheaper than *Bt*. Both insecticides can be applied by helicopter or fixed-wing aircraft, however, fixed-wing aircraft, depending on the size of the treatment block, terrain and other considerations, is generally cheaper than helicopter application. Both insecticides, when applied properly and at proper insect development, will normally provide good foliage protection and prevent or minimize tree mortality. Increased variability in reducing insect populations

generally occurs with both insecticides with high population levels. Some retreatment the following year, for various causes, may be needed with the use of either product.

NATURAL ENEMIES OF GYPSY MOTH

A predator of gypsy moth caterpillars

A predator of gypsy moth caterpillars

Table II-1.--Parasitic insects of the gypsy moth

Polyphagous (non-gypsy moth specific)	Gypsy Moth Stage Attacked
Ichneumonidae	
Coccygomimus pedalis	pupa
Itoplectis conquisitor	pupa
Chalcididae	
Brachymeria intermedia	pupa
Tachinidae	
Carcelia amplexa	larva
Compsilura concinnata	larva
Eusisyropa virilis	larva
Exorista larvarum	larva
Exorista mella	larva
Lespesia aletiae	larva
Lespesia frenchii	larva
Nemorilla pyste	larva
Spoggosia claripennis	larva
Tachinomyia supp.	larva
Monophagous/Oligophagous gypsy moth specific	
Braconidae	
Cotesia melanoscelus	larva
Ichneumonidae	
Phobocampe disparis	larva
Encyrtidae	
Ooencyrtus kuvanae	egg
Eupelmidae	
Anastatus japonicus	egg
Tachinidae	
Blepharipa pratensis	larva
Parasetigena silvestris	larva

General Considerations

Scoping identified issues and concerns which were used in developing the alternatives. Therefore, the alternatives vary by the type of intervention tactic permitted and the areas where treatment may occur. Some tactics are permitted by some alternatives, while others are not. Likewise, there are land classes within the Project Area of special concern.

There are 15 Federally-legislated wildernesses within the AIPM Project Area. The analysis in Chapter IV, discloses that these areas will be impacted under all alternatives. If intervention action is taken, the natural processes and wilderness integrity would be affected. On the other hand, if no action is taken, the gypsy moth, an exotic introduced insect, would likewise affect the natural processes and natural integrity.

Forest Service policy is to manage each wilderness on National Forest lands, "to ensure its character and values are dominant and enduring" (FSM 2320, Introduction). Wilderness management must be "consistent over time and between areas to ensure that human influence does not impede the free play of natural forces or interfere with natural successions in the ecosystems" (FSM 2320, Introduction). Included in the objectives for wilderness management is the maintenance of wilderness "in such a manner that ecosystems are unaffected by human manipulation and influence so that plants and animals develop and respond to natural forces" (FSM 2320.2 - Objectives, paragraph 2).

Actions to treat gypsy moth populations in wilderness is clearly authorized in the Special Provisions of the Wilderness Act which states that, "such measures may be taken as may be necessary in the control of ... insects... subject to such conditions as the Secretary deems desirable". [Wilderness Act, Section 4 (d)(1)]. However, the 1964 Wilderness Act does not provide direction if an exotic insect or disease is introduced into wilderness. Neither does it provide direction on whether such introductions should be considered as part of the natural process or whether these introductions should be prevented or managed to maintain the natural conditions of the areas.

Guidance for considering treatment in wilderness is provided in the Forest Service Wilderness Management Manual 2320.2 - Objectives, paragraph 2., "protect and perpetuate wilderness character..." and FSM 2324.12 - Policy, paragraph 1., "Do not control insect or plant disease outbreaks unless it is necessary to prevent unacceptable damage to resources on adjacent lands or an unnatural loss to the wilderness resource due to exotic pests." Finally, Section 7 of the Endangered Species Act directs each Federal Agency to insure that actions (or lack of actions) "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species..."

To comply with wilderness management policy and objectives, management of gypsy moth populations will not normally be considered in wilderness administered by the Forest Service within the AIPM Project Area. However, there are four exceptions or circumstances that may occur in these wildernesses under which treatment of gypsy moth infestations in wilderness would be considered provided it can be shown that treatment will have the least long-term impact on wilderness values. These exceptions only apply to wildernesses on National Forest lands within the AIPM Area.

Wilderness on National Park Service lands are not subject to these exceptions or circumstances and will not be considered for treatment under any of the alternatives in compliance with National Park Service policy.

The four circumstances under which management of gypsy moth populations in wilderness within the AIPM Project Area would be considered are when:

1. It is likely that gypsy moth will have an adverse effect on a threatened and endangered plant or animal species or habitat critical to one of these species.

2. The potential exists based on gypsy moth populations, amounts of susceptible host type in wilderness, and other site conditions, that significant defoliation and possible tree mortality is likely over a short period of time (1-2 years) thus creating a sudden catastrophic change in the wilderness ecosystem. The goal is to allow wildernesses to gradually adapt and adjust to gypsy moth without man's intervention until an equilibrium is reached where the gypsy moth exists in the ecosystem but does not dominate. However, gypsy moth has the potential to defoliate and cause mortality over large areas, possibly an entire wilderness. Action would therefore be considered to prevent such extensive defoliation to the wilderness. The first step would be to gather information and determine the level of vulnerability of wilderness to sudden catastrophic change. If unusual vulnerability exists with the threat of sudden change of the ecosystem, then intervention would be considered through a site-specific environmental analysis, with accompanying public involvement.

3. An ecosystem occurs within the wilderness in whole or part that is considered unique or rare and that ecosystem is likely to be severely affected by gypsy moth if no action is taken. A wild or native trout stream could be an example of an ecosystem that might be considered unique.

4. A situation exists where defoliating gypsy moth populations in wilderness will likely spread to adjacent private lands and adversely affect forest resources on these lands and action taken outside wilderness under the AIPM Program will not provide adequate protection. There are approximately 55 miles of wilderness boundary adjacent to private land within the AIPM Project Area. Monitoring will be intensified on lands adjacent to wildernesses with threatening gypsy moth populations. The action on adjacent land to protect a private landowner's forest resources from gypsy moth populations in wilderness will be funded entirely by the AIPM Project. However, participation in AIPM is voluntary.

Isolated infestations in wilderness within the AIPM Project Area, ahead of the generally infested zone or "leading edge", will not be treated unless one of the above conditions exists. Monitoring and treatment under AIPM will occur around wildernesses containing isolated infestations to slow the spread within the AIPM Area.

If the initial evaluation determines that treatment may be necessary in wilderness based on one or more of the stated circumstances, and the selected alternative in this EIS allows for intervention, the NEPA process will continue at the local level under the appropriate USDA Forest Service Forest Supervisor. A site-specific environmental analysis and additional appropriate NEPA documentation will be done to determine the need for action in wilderness as well as the potential impacts to the wilderness ecosystem of managing or not managing gypsy moth. Values considered for

protection in wilderness are ecological or environmental values that would benefit wilderness character and not recreational values that benefit wilderness users. In addition to the site-specific analysis, the NEPA process will involve additional scoping and public involvement, including wilderness user groups, adjacent landowners, interested or affected publics, and appropriate Forest Service or other agency personnel.

If treatment is recommended, management tactics will be limited to those tactics that only affect gypsy moth if at all possible. If gypsy moth-specific tactics are unavailable or not feasible given the gypsy moth population level, Bt (under alternative 5) and/or diflubenzuron (under Alternative 6) will be considered as a last resort.

There is another land class within the AIPM Project Area that requires special consideration. These are forested urban/suburban communities. These areas will require more intensive biological surveys and monitoring than the general forested area to minimize the impacts of gypsy moth. Prior to any intervention action, AIPM personnel will conduct biological surveys to determine the abundance, condition, and distribution of the gypsy moth infestation in the community. This will be part of the site-specific analysis. If AIPM personnel recommend management action, scoping of the interested and affected people in the community will occur to determine the relevant issues associated with managing gypsy moth. Additional NEPA documentation will be prepared as appropriate. A range of site-specific alternatives and mitigating measures to minimize the potential impacts of these alternatives will be developed. The alternatives will reflect public input, management concerns, and the tactics allowed under this EIS's selected alternative. After the site-specific alternatives are developed, they will be distributed to the public for review and comment. Involvement of the people in the community and acceptance by these individuals is essential to an effective IPM program of minimizing the damage and spread of the gypsy moth. Therefore, since the residents of urban/suburban areas and the interested general public will be involved in the site-specific decision regarding management of gypsy moth populations within their community, the range of allowable IPM options under the following alternatives is the same as in the General Project Area. Again, it should be noted that participation in the program is voluntary and that any landowner or land manager can choose not to receive treatment.

There may be other lands within the Project Area, including private lands, with management objectives similar to wilderness that can not be identified in this EIS. The site-specific environmental analysis will identify these areas and similar considerations and modifications to the site-specific alternatives can be made at that time.

The Shenandoah National Park and Blue Ridge Parkway are included in the AIPM Demonstration Project and will participate in the project by having their Congressionally mandated wilderness and lands zoned "natural" by the NPS serve as comparison areas, as well as a section of the Appalachian National Scenic Trail between Jarman Gap and Rockfish Gap. These areas will receive the same monitoring attention as the remainder of the Project Area and will be used to compare the rate of spread and impacts of gypsy moth in untreated areas to treated areas in the remainder of the Project Area. Research on impacts of the gypsy moth on native animal and plant populations in the Park will continue in these areas and some small scale methods improvement evaluations of gypsy moth specific tactics might be conducted as well. (See Appendix F for a list of research activity on Shenandoah National Park).

Alternatives Considered But Eliminated From Detailed Study

In the process of formulating alternatives, 8 alternatives were considered and later eliminated from further study. All alternatives considered and their associated intervention tactics were evaluated for their ability to meet the primary objectives of the AIPM Project and to address the major issues and concerns as expressed by the public. At this point, the costs of implementing a particular alternative were not a primary consideration.

The following alternatives considered in the analysis were eliminated from detailed study:

1. Parasite and Predator Management Only:

   This alternative involves attempts to actively manage native and introduced parasites and predators of the gypsy moth throughout the Project Area. As new parasites are imported from foreign countries and approved for release in the United States, efforts would be made to establish them in suitable areas. Attempts would be made to redistribute those parasites and predators that are presently established in the generally infested area but not found in the Project Area.

   Reason for elimination. This alternative fails to meet the stated project objectives of minimizing the spread and adverse impacts caused by the gypsy moth. As discussed in Chapter I, Outbreak Cycles and Possible Triggers, parasites and predators exert their greatest impact on the insect during the innocuous mode (low population levels), but are generally ineffective in preventing populations from building to the outbreak mode (high populations) and are incapable of reducing or slowing the spread of the insect into new areas. As the gypsy moth spreads to the South and West, insect parasites that have been established within the generally infested area move along as the gypsy moth extends its range. In some areas where parasites seem to occur in low numbers, attempts may be made to establish them as part of other alternatives.

2. Release of Sterile Life Stages Only:

   This alternative involves the release of sterile life stages of the gypsy moth in infested portions of the Project Area. The Animal and Plant Health Inspection Service (APHIS) has used this technique to eradicate isolated low-level populations in various parts of the United States (USDA FEIS, 1985, Appendix F). Two methods have been used by APHIS:

   a. Sterile male technique; this involves the release of sterile male moths that mate with native females to produce eggs that are sterile;

   b. Inherited sterility; this involves mating sub-sterilized male moths with normal females in the laboratory.

   Both the inherited sterility and sterile male techniques will be used in the AIPM Project. As discussed previously, both methods produce sterile eggs that do not hatch the following spring. If sufficient matings occur between sterile males and native females, the population is significantly reduced or eliminated from the area the following year.

Reason for elimination. While this alternative has been used successfully by APHIS to eradicate low-level isolated populations, such methods have not proven successful in areas immediately adjacent to or within the generally-infested area of the Northeast, and therefore will not meet the objectives of the project. Additional developmental work is planned on the inherited sterility technique in selected areas of the AIPM project and may eventually become an operational component, but no attempt is planned to rely on such methods solely, unless they prove highly successful in the future.

3. Allow the Moth to Spread Unchecked:

In this alternative, no Federal funds would be spent to suppress the insect on Federal, State or private lands or to implement the AIPM Project. The gypsy moth would be allowed to spread from infested to uninfested areas throughout the proposed AIPM Project area. Insect populations would build to outbreak levels and eventually collapse due to natural causes. No attempt would be made to prevent the insect from defoliating forested areas or to minimize the associated tree mortality.

Reason for elimination: This alternative was not examined in detail because it is unreasonable to assume that the elimination of Federal funds for cooperative State suppression or implementation of the AIPM Project would also prevent State agencies, industrial or private landowners, towns or communities from initiating suppression at their own expense. Such suppression would be aimed at protecting valuable shade and ornamental trees in parks, developed recreation areas, towns and communities as well as high value forest stands. Any EPA-registered insecticide approved for gypsy moth suppression could be used, provided label instructions were followed. In general, suppression efforts would lack an overall coordinated approach between communities, towns or individuals and may involve the use of insecticides that have significant adverse effects on the environment.

4. Use Silvicultural Techniques Only: (See Description of Tactics, Silvicultural)

Reason for elimination: Alone, this does not represent an integrated pest management approach. In addition, use of silvicultural techniques would not meet the objective of reducing or minimizing the rate of spread and damage caused by the gypsy moth in the AIPM Project Area.

5. Use Diflubenzuron Only:

Diflubenzuron would be the only tactic used in the AIPM Project to achieve the goals of minimizing the spread and damage caused by the gypsy moth.

Reason for elimination. The AIPM Project, as the project title suggests, is an integrated pest management demonstration project that will involve an array of intervention components. This alternative does not represent an integrated pest management approach. Annual decisions regarding the selection of particular intervention tactics to be employed in various parts of the project will be based on site-specific gypsy moth population levels and trends, site and stand information, environmental sensitivity of the area, related biological information and management objectives of the area. Where possible, the least impacting intervention tactic will be utilized to meet project objectives.

This alternative's only available intervention tactic is application of diflubenzuron. Diflubenzuron alone can meet the objectives of slowing the spread and minimizing the damage caused by gypsy moth. However, this alternative does not encourage the demonstration or operational development of new or existing technologies to meet AIPM program objectives.

6. Application of Carbaryl, Acephate, and Trichlorfon:

   Carbaryl is a broad spectrum organocarbamate compound that kills insects by both contact action and stomach poisoning. Acephate and trichlorfon are broad spectrum organophosphate compounds used as contact insecticides. All have a cholinesterase-inhibiting mode of action. They may be applied from the ground or by aerial spraying to achieve population reduction in heavy to light gypsy moth populations. Acephate may also be used as a systemic insecticide to protect valuable ornamentals by introducing the chemical into the sap stream of the tree. The insecticide is then translocated to the tree crown, where it kills insects feeding on the foliage.

   Reason for elimination: Originally, these insecticides were considered along with diflubenzuron as intervention components in several alternatives in the AIPM Project. However, based on management concerns and public input, it was decided not to include them as viable intervention components. These chemical insecticides are more impacting to nontarget insects, killing insects in all life stages except eggs. Honey bees and aquatic insects are particularly susceptible. Carbaryl and acephate have long residual characteristics. Trichlorfon is no longer produced commercially as a gypsy moth insecticide, and is not available. Although all three chemical insecticides have been approved for use by EPA and addressed in the "Gypsy Moth Suppression and Eradication Projects: Final Environmental Impact Statement, as supplemented, 1985," subsequent State suppression and eradication projects have not included them. Less environmentally-impacting treatments have been used and proven effective.

7. Ground Application of Gypsy Moth-Specific Tactics on a Significant Portion of Wilderness.

   Gypsy moth specific tactics including Gypchek (NPV), Disparlure tape, release of sterile life stages, mass trapping, and gypsy moth specific parasite release could be used through ground application throughout a significant part of a wilderness.

   Reason for elimination: Ground application requires repeated visits or intensive intrusion into wilderness by AIPM personnel applying these techniques. This would impact wilderness by trampling vegetation, creating undesirable user paths, and installing visible unnatural devices (traps or disparlure tape) that are all incompatible with wilderness management and impacting to the wilderness attributes.

8. Use Gypsy Moth-Specific Tactics Only Over the entire Project Area.

   Only gypsy moth specific tactics as discussed in item 7 above could be used in the General Project Area and wilderness. Intervention components could be applied from the ground or air where appropriate in General Project Area, and from the air only in wilderness.

Reason for elimination: The Animal and Plant Health Inspection Service (APHIS) has successfully used the mass trapping tactic alone or in combination with earlier applications of an insecticide to eradicate isolated low-level gypsy moth populations. However, good efficacy data is lacking for this intervention tactic when used in areas adjacent to the generally-infested area of the Northeast. Similar efficacy data is lacking for the use of pheromone flakes or tape alone or in combination in similar areas. NPV normally works best at moderate 250 E.M./acre or higher population levels. However, at low level populations, (less than 100 E.M. per acre) NPV efficacy information is lacking. In addition, the availability of NPV is very limited and further restricts it as a component for use in both the General Project Area and wilderness. The use of the inherited sterility tactic in areas similar to the AIPM Project Area also lacks efficacy data. While the lack of efficacy data for the host-specific tactics prevents developing this into a viable alternative that will meet the objectives of the Project for all areas in the AIPM Project, these techniques are viable when used in conjunction with other intervention tactics. Such combinations are discussed in alternatives considered in detail.

Alternatives Considered In Detail

There are six alternatives considered in detail, including the preferred alternative, (Alternative 5). Since this is an EIS for the AIPM Program, each alternative contains a range of options (including a no action option) that responds to public issues surfaced during scoping. Alternative 1 represents the no action alternative. Alternatives 2 through 6 would permit the range of options described under each alternative (table II-2). Subsequent site-specific analyses and additional NEPA documentation as needed for the AIPM Project will be tiered to this document.

The alternatives are:

Alternative 1. No Action. There would be no AIPM Project as currently planned. The monitoring system, for which there are no impacts, has been put in place using AIPM funding. However, under this alternative, AIPM funding would not be used for intervention activities against the gypsy moth, and the proposed project as planned would not be implemented. However, this does not mean that there would be no action taken against the gypsy moth within the proposed AIPM Project Area. The information gathered by the AIPM monitoring system would be used for cooperative suppression or eradication programs that would take place under the regular gypsy moth suppression program. The potential impacts from these programs are covered under the Final Environmental Impact Statement as Supplemented for Gypsy Moth Suppression and Eradication Projects prepared in 1985 and annual environmental assessments tiered to that document. Funding for these current programs comes from several sources. The Forest Service administers a cooperative funding program with the States for suppression projects. Eradication projects are administered and cooperatively funded by the Animal and Plant Health Inspection Service (APHIS). There may be other suppression projects within the area using State or private funding and finally, suppression on national forests and other Federal lands may also be implemented.

Alternative 2. In the General Project Area, including forested urban/suburban communities, this alternative would allow treatment using tactics that only affect gypsy moth (gypsy moth specific) and/or biological tactics. No chemical insecticides would be allowed using AIPM funding. Gypsy moth specific tactics include disparlure (tape/flakes), release of sterile life stages, mass trapping, release of parasites that only affect gypsy moth, and the application of Gypchek (NPV). Biological tactics include the use of Bt and release of parasites and predators.

Wilderness will not be treated. No buffer zones would be necessary adjacent to wilderness under this alternative. Gypsy moth populations within wilderness will be monitored as necessary so treatment outside wilderness can occur to slow the spread of gypsy moth and protect the forest resources surrounding wilderness.

Buffer zones around other no-treatment areas, including individual landowners in urban/suburban areas and the General Project Area who do not wish their land to be treated, will be established as needed. The width of buffer zones will be based on site-specific conditions, including terrain and local weather conditions on the day of treatment, as well as type of treatment being applied and method of application.

Alternative 3. In the General Project Area, this alternative would allow a full IPM approach to managing gypsy moth with treatments as necessary, consisting of the gypsy moth specific tactics and biological tactics described in alternative 2, and with the insect growth regulator, diflubenzuron.

Forested urban/suburban areas could also be treated using the tactics listed for use in the General Project Area. The use of these intervention tactics and any specific mitigating measures will depend on the site-specific analysis and coordination with the local affected residents. Effective alternatives for treatment will be presented to the public, and the selected method of treatment will be determined based on that input and the site-specific analysis.

Wilderness would not be treated. A buffer zone will be established adjacent to and outside of wilderness when diflubenzuron is applied from the air in the General Project Area adjacent to wilderness. This buffer zone will vary in size due to on-site conditions such as terrain, weather conditions at the time of treatment and the type of aircraft used (See Mitigating Measures, for additional direction when treating adjacent to wilderness). If needed, the buffer zone could be treated with the gypsy moth specific tactics or biological tactics described under alternative 2. Diflubenzuron may be used in the buffer zone to protect adjacent private land if the site-specific analysis determines that adequate protection is not possible by the use of or lack of availability of gypsy moth specific tactics or by the use of biological tactics. Monitoring in wilderness will occur as described in alternative 2.

Buffer zones, as discussed under alternative 2, will be established as needed.

Alternative 4. In the General Project Area, including the forested urban/suburban areas, this alternative would allow treatment with the same tactics and considerations described under alternative 3.

Wilderness will not normally be treated. Treatment would only be considered if one or more of the conditions described on page II-13, occur. If treatment is considered, only those tactics that specifically affect the gypsy moth and have the least impact to the wilderness will be used. These include aerial applications of disparlure flakes, Gypchek (NPV), and sterile eggs, as well as the use of ground intervention tactics such as mass trapping, disparlure tape, release of sterile life stages and the release of gypsy moth specific parasites. However, the site-specific analysis must indicate that the intervention action is necessary to prevent one or more of the 4 conditions (see page II-13) from occurring. In addition, the proposed action must not have significant impact to wilderness.

A buffer zone will be established adjacent to and outside of wilderness when diflubenzuron is applied from the air in the General Project Area adjacent to wilderness. This buffer zone will vary in size due to on-site conditions such as

terrain, weather conditions at the time of treatment and the type of aircraft used (See Mitigating Measures, for additional direction when treating adjacent to wilderness). If needed, the buffer zone could be treated with gypsy moth specific tactics or biological tactics. Diflubenzuron may be used in the buffer zone to protect adjacent private land if the site-specific analysis determines that adequate protection is not possible by the use of or lack of availability of gypsy moth specific tactics or by the use of biological tactics. Monitoring in wilderness will occur as described in alternative 2.

Buffer zones, as discussed under alternative 2, will be established as needed.

Alternative 5. (Preferred) In the General Project Area, including the forested urban/suburban areas, this alternative would allow treatment with the same tactics and considerations described under alternative 3.

Wilderness will not normally be treated. Treatment would only be considered if one or more of the conditions described on page II-13, occur. Aerial applications of disparlure flakes, Gypchek (NPV) and Bt, and sterile eggs as well as ground intervention tactics such as mass trapping, disparlure tape, release of sterile life stages and the release of gypsy moth specific parasites, may be used. The gypsy moth specific tactics would be considered first because they are less impacting to natural processes (See Chapter IV). However, the site-specific analysis must indicate that the intervention action is necessary to prevent one or more of the 4 conditions (see page II-13) from occurring. In addition, the proposed action must not have significant impact to wilderness.

A buffer zone will be established adjacent to and outside of wilderness when diflubenzuron is applied from the air in the General Project Area adjacent to wilderness. This buffer zone will vary in size due to on-site conditions such as terrain, weather conditions at the time of treatment, and the type of aircraft used (See Mitigating Measures, for additional direction when treating adjacent to wilderness). If needed, the buffer zone could be treated with gypsy moth specific tactics or biological tactics. Diflubenzuron may be used in the buffer zone to protect adjacent private land if the site-specific analysis determines that adequate protection is not possible by the use of or lack of availability of gypsy moth specific tactics or by the use of biological tactics. Monitoring in wilderness will occur as described in alternative 2.

Buffer zones, as discussed under alternative 2, will be established as needed.

Alternative 6. In the General Project Area, including the forested urban/suburban areas, this alternative would allow treatment with the same tactics and considerations described under alternative 3.

Wilderness will not normally be treated. Treatment would only be considered if one or more of the conditions described on page II-13, occur. Aerial applications of disparlure flakes, Gypchek (NPV), Bt, sterile eggs and diflubenzuron, as well as the ground intervention tactics such as mass trapping, disparlure tape, release of sterile life stages and the release of gypsy moth host-specific parasites may be used. The gypsy moth specific tactics would be considered for use first. However, the site-specific analysis must indicate that the intervention action is necessary to prevent one or more of the 4 conditions (see page II-13) from occurring. In addition, the proposed action must not have significant impact to wilderness.

If wilderness is not to be treated, but treatment is planned in the adjacent General Project Area, a buffer zone will be established adjacent to and outside of wilderness when diflubenzuron is applied from the air. This buffer zone will vary in size due

to on-site conditions such as terrain, weather conditions at the time of treatment and the type of aircraft used (See Mitigating Measures, for additional direction when treating adjacent to wilderness). If needed, the buffer zone could be treated with gypsy moth specific tactics or biological tactics. Diflubenzuron may be used in the buffer zone to protect adjacent private land if the site-specific analysis determines that adequate protection is not possible by the use of or lack of availability of gypsy moth specific tactics or by the use of biological tactics. If treatment is planned in wilderness, the buffer can be treated with the same tactic as that used in wilderness. Monitoring in wilderness will occur as described in alternative 2.

Buffer zones, as discussed under alternative 2, will be established as needed.

Trap

Phermone traps and egg mass surveys indicate gypsy moth population levels

Survey

Table II-2.--AIPM alternatives. Summary of gypsy moth intervention tactics that may be used under each alternative.

ALTERNATIVE	GENERAL PROJECT AREA (includes Federal, State, and private lands other than wilderness)	WILDERNESS*
1	NO AIPM PROJECT	NO AIPM PROJECT
2	NO TREATMENT GM SPECIFIC TACTICS BIOLOGICAL TACTICS	NO TREATMENT
3	NO TREATMENT GM SPECIFIC TACTICS BIOLOGICAL TACTICS DIFLUBENZURON	NO TREATMENT
4	NO TREATMENT GM SPECIFIC TACTICS BIOLOGICAL TACTICS DIFLUBENZURON	NO TREATMENT GM SPECIFIC TACTICS *
5	NO TREATMENT GM SPECIFIC TACTICS BIOLOGICAL TACTICS DIFLUBENZURON	NO TREATMENT GM SPECIFIC TACTICS * BIOLOGICAL TACTICS *
6	NO TREATMENT GM SPECIFIC TACTICS BIOLOGICAL TACTICS DIFLUBENZURON	NO TREATMENT GM SPECIFIC TACTICS * BIOLOGICAL TACTICS * DIFLUBENZURON *

GM Specific Tactics: Tactics that have been designed to affect gypsy moth specifically. For the General Project Area, this includes Gypchek (NP virus), Disparlure (tape/flakes), release of sterile life stages, mass trapping, and gypsy moth specific parasite release.

Biological Tactics: *Bacillus thuringiensis* (B*t*), parasites and predators.

*Gypsy Moth intervention tactics may be considered in wilderness provided one or more of the following conditions exist: (1) a threat to T&E species or related critical habitat, (2) to protect unique ecosystems, (3) to avoid catastrophic change and (4) to protect adjacent private land. (See page II-13 for complete discussion of when tactics may be considered for use in wilderness).

COMPARISON OF ALTERNATIVES

The following discussion compares the alternatives considered in detail as they relate to the issues and environmental consequences disclosed in chapter IV (see table II-3).

Alternative 1. The no action alternative means that no AIPM intervention projects will be conducted on State, private, or Federal lands under the AIPM Program. However, the USDA-funded suppression or eradication projects and technical assistance will continue to be available. Isolated infestations would be subject to treatment by regulatory agencies such as APHIS or State regulatory agencies. Action taken by State, municipal, or private individuals to suppress gypsy moth is also possible.

Under the current cooperative cost sharing gypsy moth suppression program, the maximum contribution made by the Federal government is 50 percent of the project cost. It is likely, therefore, that there would be fewer areas treated under this program than under the AIPM Program which will provide 100% funding for the cost of a suppression project. Therefore, it is likely that there would be an increase in losses of timber and shade trees in the AIPM Project Area if the AIPM Program is not implemented.

Isolated infestations that remain untreated within the Project Area would be expected to expand through natural spread of the insect. Depending on the local environmental and physical conditions, the expansion may be rather slow or quite rapid. Untreated populations that build to defoliating levels will result in losses of shrubs, ornamental trees, and timber. Insect nuisance problems will increase.

Alternative 1 does not meet the AIPM objective to slow the spread and minimize the effects of gypsy moth. Existing suppression programs have not proven effective in slowing the natural spread because not all infested areas are treated under these programs.

This alternative is responsive to Major Issue Statement 1 (Impacts to nontarget organisms). Treatment under the AIPM Program would not occur and therefore there would be no impacts to nontarget organisms from this Program. Without any AIPM projects, there is no concern for nontarget impacting tactics. This alternative does not preclude other USDA-funded suppression or eradication projects that may impact nontargets.

In response to Major Issue Statement Statement 2 (Impacts of gypsy moth infestation), without the AIPM Program, spread and the accompanying undesirable impacts of gypsy moth infestations are likely. This alternative addresses public input questioning the need for an AIPM Project.

In response to Major Issue Statement 3 (Impacts to special management areas), the absence of the AIPM Program will have no direct impact to the environment resulting from intervention tactics. However, allowing the moth to run its course may lead to impacts less desirable than those that would accompany treatment.

In wilderness, natural integrity will improve with time. There would be no human manipulation, so change would be made by nature. The apparent naturalness of wilderness will be impacted, if defoliation caused by this pest becomes readily noticeable. (See Appendix A for a discussion of wilderness attributes).

Depending on the wilderness users' expectations, opportunities for primitive recreation in wilderness may be improved or lowered. In areas of high gypsy moth population, the insect may detract from the wilderness experience by its impacts and could affect the number of visitors to the area. Yet other users may find these factors a physical and mental challenge to overcome. In the long term, the physical and mental challenges within wilderness will change, and there will be a variety of primitive recreation opportunities.

Opportunities for solitude within wilderness will be reduced in the short term, if vegetative screening is reduced by defoliating gypsy moth populations. Different tree species would succeed the tree species favored by gypsy moth. In the long term, opportunities for solitude would return as the ecosystem adjusts to the presence of gypsy moth. Supplemental attributes may be affected. For instance, the number and size of old growth trees of species susceptible to gypsy moth would be reduced.

Scenic values in wilderness would be affected. Large numbers of defoliated trees and associated mortality may occur which would be readily apparent and contrast with natural surroundings. Long-term effects on tree species composition and density would reflect the presence of gypsy moth. In the long term, scenic values will improve as less susceptible tree species become part of the scenic landscape.

Alternative 1 does not respond to issue 4 (effectiveness of intervention tactics) because there would be no attempt to slow the spread of the gypsy moth. A number of public responses expressed a desire to use an efficacious means as possible to slow the spread and minimize the effects of this pest.

There would be no known human health concerns (issue number 5) related to intervention tactics from AIPM Program if the Program is not implemented. Minor human health impacts due to allergic reactions to the gypsy moth may occur. There would be concerns with the current suppression/eradication cooperative projects that could occur under this alternative. However, these issues and concerns are addressed in the existing 1985 EIS (USDA 1985).

<u>Alternative 2</u>. AIPM projects may be planned and implemented on State, private, and Federal lands. Site specific environmental analyses will be prepared by AIPM personnel and managing agencies to determine specific area of treatment, associated environmental impacts, intervention tactics, and mitigation needed to reduce the impacts. AIPM projects will be funded. Action taken by State, municipal, or private individuals to suppress or eradicate gypsy moth may occur independently of the AIPM Program. Although such projects will not receive AIPM funding, it is desirable that managers or owners of these lands cooperate in coordinating these actions with AIPM projects.

This alternative supports the AIPM objective of slowing the spread and minimizing adverse effects of gypsy moth within the Project Area.

In response to Major Issue Statement 1 (Impacts to nontargets organisms), alternative 2 includes tactics that have been developed to specifically affect the gypsy moth. Biological tactics can also be used. These tactics may impact other Lepidopterous insects that are feeding on foliage within the treatment area at the time of treatment. However, the biological tactics are less impacting to nontarget organisms than chemical insecticides.

Alternative 2 is not fully responsive to Major Issue Statement 2 (Impacts of gypsy moth infestations). The tactics included in this alternative will reduce gypsy moth impacts, but they may not be as effective as needed in treating extremely high gypsy

moth populations over extensive areas. Gypsy moth infestations will not be treated within wilderness.

In response to Major Issue Statement 3 (Impacts to special management areas), the specific tactic or combination of tactics used in this alternative will consider input from forested urban/suburban communities as well as management requirements of recreation areas, research natural areas, threatened and endangered species habitat, and other special management areas in the site-specific environmental analyses. Impacts due to gypsy moth would be less than alternative 1 because more areas would be treated and the objectives of the AIPM Project are to slow the spread and reduce damage caused by the gypsy moth. The impacts to nontarget organisms from intervention tactics would be less than alternatives 3, 4, 5 and 6 because diflubenzuron would not be used. The effects of no treatment on the wilderness attributes will be the same as discussed under alternative 1.

In response to Major Issue Statement 4 (effectiveness of intervention tactics), alternative 2 provides a range of tactics that should be effective in controlling gypsy moth in the General Project Area. However, gypsy moth-specific tactics and biological tactics may not be as effective in treating extremely high gypsy moth populations.

In response to Major Issue Statement 5 (Impacts to Human Health), there are no human health impacts associated with gypsy moth control tactics proposed. Applications of Bt and NPV are considered to pose no known threat to human health. In over 18 years of operational use, there have been no scientifically documented cases or evidence of Bt-caused illness directly attributable to forestry use situations. Similarly, no documented cases of illness have been attributed to the use of NPV. Minor human health impacts may accompany high gypsy moth infestations in wilderness (Tuthilland others 1984).

Alternative 3. Alternative 3 is the same as alternative 2, except that the chemical insecticide diflubenzuron is added as an intervention tactic in the General Project Area.

This alternative provides a broader range of tactics in an IPM approach to treat all gypsy moth populations as needed in the General Project Area and responds to the AIPM objective of slowing the spread and minimizing adverse effects of gypsy moth.

This alternative responds to Major Issue Statement 1 (Impacts to nontarget organisms) similarly to alternative 2, with gypsy moth specific and biological tactics permitted in the general project area. However, the addition of the chemical insecticide diflubenzuron as an intervention tactic may result in this alternative having additional impacts to nontarget organisms. The use of diflubenzuron may impact molting nontarget insects and crustaceans. Adults will not be affected.

In response to Major Issue Statement 2 (Impacts of gypsy moth infestations), a wider range of intervention tactics available provides greater assurance of control to reduce gypsy moth related impacts in the general project area.

In response to Major Issue Statement 3, (Impacts to Special Management Areas), the effects would be similar to those discussed under alternative 2. In addition, there could be additional impacts due to the use of diflubenzuron. However, if these impacts can be adequately mitigated, this alternative will provide a broader range of intervention tactics providing a greater opportunity to design treatment for areas with special management considerations.

Wilderness will not be treated. The effects of no treatment on the wilderness attributes will be the same as discussed under alternative 1.

Alternative 3 responds to Major Issue Statement 4 (Effectiveness of intervention tactics). A wider range of intervention tactics that includes diflubenzuron provides a greater assurance of effectiveness in treatment. The use of diflubenzuron in previous suppression and eradication projects has demonstrated its effectiveness in situations of extremely high gypsy moth populations over extensive areas. This alternative provides a greater range of tactics that can protect areas adjacent to no-treatment zones such as wilderness, NPS natural areas, or private land.

Alternative 3 is responsive to Major Issue Statement 5, Impacts to Human Health. Gypsy moth specific tactics, Bt and NPV, pose no known threat to human health. Since diflubenzuron interrupts chitin synthesis, which does not occur in higher organisms, it poses very low mammalian toxicity. All possible human exposures, as discussed in Appendix C, Plain Language Summary of the Health Risk Analysis for Diflubenzuron are below the ADI set by EPA. As in alternatives 1 and 2, minor human health impacts may occur in wilderness due to allergic reactions to the gypsy moth.

Alternative 4. Gypsy moth intervention tactics proposed for the General Project Area for alternative 4 are the same as those in alternative 3. Discussion of the response to the AIPM objectives and Major Issue Statements for alternative 3 is applicable for alternative 4, within the General Project Area.

This alternative differs from alternatives previously compared in that a range of intervention tactics are available for use in wilderness. Alternative 4 effects on wilderness attributes may be different from those described in alternatives 1, 2, and 3 because intervention tactics to suppress gypsy moth in wilderness could occur. However, the effects on wilderness attributes in untreated areas would be similar as described in alternatives 1, 2 and 3.

Under alternative 4, the natural integrity in wilderness will be directly affected by gypsy moth intervention techniques if implemented. The existing wilderness environment will reflect human influences rather than biological processes. However, as long as intervention techniques are successful and continued, this alternative will minimize the effects of gypsy moth on the natural succession of the existing wilderness environment. Resulting changes in insect populations will reflect human influence rather than biological forces.

Apparent naturalness within wilderness will be affected if the treatment option is selected. Evidence of human activities will be present where intervention tactics occur. Ground intervention tactics such as the placement of traps or disparlure tape will be apparent to the wilderness user and will appear out of place. Aircraft and ground support personnel, not normally associated with wilderness, will be present during aerial application of intervention techniques. Indirect and cumulative impacts such as vegetation trampling, cutting of brush and the proliferation of undesirable trails and their associated impacts may occur. Intervention techniques, if effective, will help perpetuate the existing wilderness character, although the evidence of human influence may be pronounced.

Existing opportunities for primitive recreational experiences will be perpetuated under this alternative if gypsy moth populations are suppressed. A reduction in the number of visitors to wilderness may occur if they object to the treatment types employed.

Physical attributes such as vegetation screening should not be dramatically changed within wilderness under alternative 4. If intervention is selected, opportunities for solitude will be reduced due to the increased likelihood of contact between AIPM personnel and wilderness visitors, particularly with ground intervention tactics. Aerial application techniques will affect solitude during the period of application.

The impacts to the supplemental attribute of old growth trees from gypsy moth will be reduced under alternative 4 if treatment is done and success in protecting these old growth trees is achieved.

The existing natural scenic qualities of wilderness may be perpetuated under alternative 4 if treatment is taken and successful, although a minor amount of defoliation and mortality may occur. Intervention tactics employing physical means such as traps or disparlure tape will impact scenic values. Evidence of these ground intervention tactics will contrast with the existing scenic environment because of their physical features (size, color, shape, etc.). Long term effects will tend to perpetuate existing scenic values although certain intervention tactics may impact these values during periods of application.

Alternative 5. Gypsy moth intervention tactics for the General Project Area for alternative 5 are the same as those included in alternatives 3 and 4. Alternative 5 is the same as these alternatives in response to the AIPM objectives and Major Issue Statements for the General Project Area.

Alternative 5 is similar to alternative 4 in treatment of wilderness, although a wider range of intervention tactics is included. *Bt* may be used in wilderness, in addition to the tactics described in alternative 4. Effects on wilderness attributes for alternative 5 are different than for alternative 4. However, the effects on wilderness attributes in untreated areas would be similar as described for alternatives 1, 2 and 3.

Treatment options under alternative 5 will affect natural integrity by the addition of *Bt* as a possible intervention tactic. This is due to the potential adverse impacts to nontarget native Lepidoptera species.

The effects to the remaining wilderness attributes--apparent naturalness, opportunities for primitive recreation, opportunities for solitude, supplemental attributes, and scenic values--should be similar to those described under alternative 4.

Alternative 6. Gypsy moth intervention tactics for the General Project Area for alternative 6 are the same as those included in alternatives 3, 4 and 5. Alternative 6 is the same as these alternatives in response to the AIPM objectives and Major Issue Statements for the General Project Area.

Alternative 6 is similar to alternatives 4 and 5 in treatment of wilderness, although a wider range of intervention tactics is included. Diflubenzuron may be used in wilderness, in addition to the tactics described in alternatives 4 and 5. Effects on wilderness attributes for alternative 6 are different than for alternatives 4 and 5. However, the effects on wilderness attributes in untreated areas would be similar as described for alternatives 1, 2 and 3.

Natural integrity may be affected more under alternative 6 if intervention tactics are employed than under other alternatives. The addition of diflubenzuron as a possible intervention tactic may have additional adverse impacts to insects and crustaceans (Willcox and Coffey 1978).

The remaining attributes - apparent naturalness, opportunities for primitive recreation, opportunities for solitude, supplemental attributes, and scenic values should be similar to those described under alternatives 4 and 5.

Table II-3.--Comparison of alternatives by major issues.

Major Issues	Alternative(s)	Summary
Issue Statement 1 (Impacts of treatment to nontargets)	1	No AIPM tactics proposed to impact non-targets. Co-op program may impact non-targets.
	2	No impacts from gypsy moth-specific tactics. Biological tactics may impact other Lepidoptera.
	3-6	No impacts from gypsy moth-specific tactics. Biological tactics may impact other Lepidoptera; diflubenzuron may impact some insects and crustaceans.
Issue Statement 2 (Impacts of Gypsy Moth)	1	Gypsy moth impacts possible in non-treated areas.
	2-3	Gypsy moth impacts reduced in General Project Area but not in wilderness.
	4	Gypsy moth impacts reduced in General Project Area and in wilderness.
	5	Gypsy moth impacts reduced in General Project Area and further reduced in wilderness.
	6	Gypsy moth impacts reduced throughout Project Area.
Issue Statement 3 (Impacts on Special Management Areas)	1	Gypsy moth impacts possible in non-treated areas.
	2	Gypsy moth impacts reduced in General Project Area, but not in wilderness. Tactic impacts less than under alternatives 3,4,5 and 6.
	3	Gypsy moth impacts reduced in General Project Area, but not in wilderness. Tactic impacts may occur.
	4	Gypsy moth impacts reduced in General Project Area, reduced in wilderness. Tactic impacts may occur. Impacts to wilderness less than alternatives 5 and 6.
	5	Gypsy moth impacts minimized in General Project Area, reduced in wilderness. Tactic impacts may occur. Impacts to wilderness less than under alternative 6.
	6	Gypsy moth impacts minimized. Tactic impacts may occur.

Table II-3.--Comparison of alternatives by major issues (continued).

Issue Statement 4 (Effectiveness of Intervention Tactics)	1	No AIPM-funded intervention tactics.
	2	In General Project Area, provide a limited range of tactics. Effectiveness limited by population levels and/or insect life stages. Wilderness not applicable.
	3	In General Project Area, broader range of tactics. Effectiveness less limited by population levels or insect life stages. Wilderness not applicable.
	4	In General Project Area, same as alternative 3. In wilderness, limited range of tactics. Effectiveness limited by population levels and/or by insect life stages.
	5	In General Project Area, same as alternative 3. In wilderness, range of tactics less limited than under alternative 4. Effectiveness less limited by insect population levels and/or by insect life stages.
	6	Broader range of tactics. Effectiveness less limited over Project Area than other alternatives.
Issue Statement 5 (Impacts on Human Health)	1	Sensitive individuals may experience minor gypsy moth-related allergic reactions.
	2	No scientific data indicating human health problems associated with the tactics. Sensitive individuals may experience minor gypsy moth-related allergic reactions in untreated areas.
	3	No scientific data indicating human health problems associated with gypsy moth specific or biological tactics. Risk assessment (Appendix C) indicates potential effects to human health from the use of diflubenzuron to be extremely low. All human exposure estimates are below established ADI. Sensitive individuals may experience minor gypsy moth-related allergic reactions in untreated areas.
	4	Same as alternative 3.
	5	Same as alternative 3.
	6	Same as alternative 3.

SUMMARY OF ENVIRONMENTAL EFFECTS OF ALTERNATIVES

The environmental consequences of each alternative considered in detail are discussed in Chapter IV. A summary of the environmental consequences follows in table II-4.

Table II-4.--Summary of environmental consequences in the AIPM Project Area.

Environmental Elements	Alternative(s)	Summary
Vegetation	1	Significant defoliation possible with associated tree mortality; long term change in cover type may result. Wildfire control may be more difficult if significant gypsy moth caused mortality occurs.
	2-6	With the exception of the inherited sterility tactic, there are no direct, indirect or cumulative impacts to vegetation from intervention tactics. There may be short-term direct effects from the inherited sterility tactic. In wilderness, the potential impacts similar to alternative 1 are possible under alternatives 2 and 3. There would be no impacts to vegetation in wilderness under alternatives 4, 5 and 6, except from the inherited sterility tactic..
Wildlife (vertebrates except fish)	1	No known direct effects. Indirect effects include temporary changes in habitat, some food supplies and shifts in some populations as well as possible long term changes in habitat diversity, food variety and numbers or abundance of animals. Cumulative effects of repeated gypsy moth defoliations would amplify these short and long term effects.
	2	Reduction of effects caused by gypsy moth possible except in wilderness. No known direct effects. Indirect effects consist of short-term reductions of some food supplies for some insect eaters in treated areas. Cumulative effects of repeated treatments consist of extended duration of indirect effects.
	3	Reduction of effects caused by gypsy moth possible except in wilderness. No known direct effects. Indirect and cumulative effects similar to effects of alternative 2, except populations of insects susceptible to diflubenzuron will be unavailable as a food source for a longer period of time in treated areas. Cumulative effects of repeated treatments consist of extended duration of indirect effects.
	4	Reduction of effects caused by gypsy moth possible throughout project area. Direct, indirect and cumulative effects are identical to those for alternative 3 in General Project Area. Direct, indirect and cumulative effects in wilderness are associated with reductions of gypsy moth as a food source in treated areas.

Table II-4.--Summary of environmental consequences in the AIPM Project Area (continued).

(Wildlife Cont.)	5	Reduction of effects of gypsy moth possible throughout project area. Direct, indirect and cumulative effects identical to those for alternatives 3 and 4 in general project area. In wilderness, direct, indirect and cumulative effects would be similar to those found in alternative 2 (General Project Area).
	6	Reductions of effects of gypsy moth possible throughout project area. Direct, indirect and cumulative effects similar to those described for general project area in alternative 3.
Insects, snails and crustaceans	1	No direct effects. Indirect effects would be gypsy moth competes with leaf-eating insects for food and habitat.
	2	No known direct effects due to gypsy moth specific tactics. Bt may directly impact nontarget Lepidoptera. This effect may be cumulative if two Bt applications are made per year or in consecutive years. Except in wilderness, reductions of effects of gypsy moth are possible.
	3-6	For alternatives 3-6, same as alternative 2; diflubenzuron may directly impact some nontarget insects and crustaceans. The potential exists for these impacts to be cumulative if applications of diflubenzuron are made in consecutive years. In wilderness, effects similar to those described under alternative 1 could occur under alternative 3. Reductions of effects of gypsy moth are possible throughout project area in alternatives 4-6.
Endangered, Threatened and Sensitive Species (E,T&S)	1	There are no known direct effects. There may be adverse indirect effects if defoliation alters habitats. Some species may benefit if tree mortality occurs. In areas containing untreated outbreak of gypsy moth populations, the potential exists for direct impact to E&T plants.
	2	Existing habitats would benefit with successful treatments. Bt may have a direct adverse impact on nontarget E,T&S Lepidoptera larvae that feed on foliage within 7-14 days of application. There may be cumulative effects on these species if two applications are applied per year or in consecutive years. Feeding strategies of insect eating E,T&S species may change in response to reduced populations of Bt sensitive lepidoptera. E,T&S plants could benefit if treatment maintains low gypsy moth populations.

Table II-4.--Summary of environmental consequences in the AIPM Project Area (continued).

(E,T&S Cont.)	3-6	In addition to effects of Bt in alternative 2, diflubenzuron may have a direct impact on some nontarget E,T or S insects and crustaceans. These effects may persist if applications are applied in consecutive years. Existing habitats would benefit with successful treatment. In wilderness, effects similar to those described under alternative 1 could occur under alternative 3.
Fish & Aquatic Ecosystems	1	Direct beneficial effect if gypsy moth larvae provide additional food. Indirect beneficial effect if water nutrient content is increased due to gypsy moth feeding activity.
	2	There are no known adverse effects of gypsy moth specific or biological tactics. Effects of gypsy moth would be reduced.
	3-6	No direct effects on fish. Potential for some aquatic insect and crustacea populations to be reduced temporarily following treatments with diflubenzuron. In wilderness, effects similar to those described under alternative 1 could occur under alternative 3.
Soil	1	Defoliation speeds nutrient transfer to soil.
	2-6	For alternatives 2-6, no known direct, indirect or cumulative impacts. In wilderness, effects similar to those described under alternative 1 could occur under alternative 2 and 3.
Water Quality	1	Possible short term effect on odor, taste and color in defoliated areas.
	2-6	In General Project Area, there are no known direct, indirect or cumulative effects. In wilderness, effects similar to those described under alternative 1 could occur under alternative 2 and 3.

Table II-4.--Summary of environmental consequences in the AIPM Project Area (continued).

Visual Resources	1	Direct short-term effects to aesthetics in defoliated and refoliated areas.
	2-6	In General Project Area, no known adverse effects. Intervention tactics should reduce gypsy moth impacts on the visual resource. In wilderness, effects similar to those described under alternative 1 could occur under alternatives 2 and 3. There are no known adverse effects under alternatives 4, 5 and 6.
Recreation	1	Direct short-term impact on use of developed recreation sites during treatment application or if severe defoliation occurs because of no treatment. Effect on use may be long-term if mortality of high value trees occurs. Recreational experience in dispersed areas could be affected.
	2-6	Impacts of gypsy moth to developed and dispersed recreation areas should be reduced. Use may decline during time of treatment or avoided following treatment. Use would be affected for short periods if areas are temporarily closed during time of treatment. Intervention methods should reduce direct, indirect and cumulative effects of gypsy moth.
Cultural Resources	1-6	No impacts anticipated.
Public Health	1	Sensitive individuals may experience minimal gypsy moth-related allergic reactions.
	2-6	No scientific data indicating human health problems associated with gypsy moth-specific or biological tactics. Risk assessment (Appendix C) indicates potential effects to human health from use of diflubenzuron to be extremely low. All human exposure estimates are below established ADI.
Socio-Economic	1	If gypsy moth tree mortality causes timber supply to exceed demand, local timber market prices may decrease.
	2-6	Intervention tactics should reduce gypsy moth-caused tree mortality, which would benefit timber--an important economic resource in the Project Area. Intervention would help reduce gypsy moth-caused fluctuations of timber supply to local markets.
Prime Farm and Rangeland	1-6	For alternatives 1-6, no impacts anticipated.

Table II-4.--Summary of environmental consequences in the AIPM Project Area (continued).

Wetlands and Flood plains	1-6	For alternatives 1-6, no impacts anticipated.
Consumers, Civil Rights, Minorities and Women	1-6	For alternatives 1-6, no impacts anticipated.
WILDERNESS ATTRIBUTES:		
Natural Integrity	1-3	Direct impacts to natural processes by gypsy moth. Long term impacts produce changes in the existing ecosystem. Indirect and cumulative effects will show natural processes adapting to gypsy moth.
	4	Direct impacts to natural processes by gypsy moth in no-treatment areas. Long-term impacts produce changes in existing ecosystem from no treatment. Indirect and cumulative effects will show natural processes adapting to gypsy moth in no-treatment areas. Direct impacts by gypsy moth-specific tactics will reflect human intervention, but existing ecosystems will be perpetuated if these tactics are successful and are continually applied when needed. Long term effects will reflect a continual need for human intervention in the control of gypsy moth.
	5	Impacts from no treatment and gypsy moth-specific tactic are the same as in alternative 4. Additional direct impacts to natural processes will occur as the use of <u>Bt</u> reduces the population size of susceptible, nontarget Lepidoptera in treatment zones present at the time of application. Cumulative impacts may occur as those susceptible nontarget Lepidoptera in treatment zones are reduced in population size in consecutive years of spray applications. A continual need for human intervention in the control of gypsy moth will be required.
	6	Impacts from no treatment, gypsy moth-specific tactics and the application of <u>Bt</u> are the same as in alternative 5. Additional direct impacts to natural processes will occur, as the use of diflubenzuron will adversely affect some nontarget invertebrate organisms. Diflubenzuron will reduce these susceptible organisms if present in the treatment zone at the time of application. Cumulative impacts to these susceptible organisms may occur (further reduction in population size) in the treatment zones if diflubenzuron is used in succeeding years. A continual need for human intervention will be required for the control of gypsy moth.

Table II-4.--Summary of environmental consequences in the AIPM Project Area (continued).

Apparent Naturalness	1-3	Direct impacts to the wilderness ecosystem would be readily noticeable to the general public when compared to treated areas. Associated defoliation and tree mortality in susceptible wilderness would contrast with pre-gypsy moth wilderness environment. Indirect effects from changes in the natural processes caused by gypsy moth could affect biological diversity of the areas, resulting in an environment that contrasts with areas located outside wilderness.
	4-6	Intervention techniques maintain existing naturalness of the area. Direct impacts would be from AIPM personnel and equipment in the area at the time of application. Cumulative impacts would be limited to repeated use of intervention techniques when necessary to manage gypsy moth in wilderness.
Primitive Recreation Opportunity	1-3	Direct impacts to recreational experiences through tree defoliation and mortality by gypsy moth. Primitive conditions created by tree mortality, subsequent new plant growth and changes in the wilderness ecosystem would allow for a high degree of challenge and risk. Nuisance factors created by high populations of gypsy moth larvae may detract from the expected wilderness experience. Long term effects of gypsy moth infestation would provide a change in the existing physical and mental challenges and the variety of primitive recreational opportunities as the wilderness ecosystem adjusts to the presence of gypsy moth.
	4-6	Existing opportunities for primitive types of recreational experiences are maintained. Changes in the types of opportunities and experiences proceed as a natural process.
Opportunity for Solitude	1-3	Direct short-term impact as existing foliage used as screening is defoliated. Long-term impacts in the form of new vegetative growth replacing gypsy moth-caused mortality, thus increasing opportunities for solitude as the ecosystem adjusts to gypsy moth.
	4-6	Existing vegetative screening maintained, thus preserving opportunities for solitude. Short-term adverse impact in that opportunities for solitude are reduced in the form of increased contact between wilderness users and AIPM personnel. Cumulative impacts in the form of frequent and continual need to enter wilderness for gypsy moth activities reduce overall opportunities for solitude.

Table II-4.--Summary of environmental consequences in the AIPM Project Area (continued).

Supplemental Attributes	1-3	Direct impact to old growth trees through defoliation and subsequent tree mortality. Value of the area to serve as a baseline for natural processes is preserved. Effects to endangered, threatened and sensitive species are similar to those outlined in the General Project Area under alternative 1.
	4-6	Old growth trees are protected from effects of gypsy moth. Value of wilderness to serve as a baseline for natural processes is lost. Effects to endangered, threatened and sensitive species are similar to those outlined in the General Project Area.
Scenic Values	1-3	Direct impacts to the visual resource through tree defoliation and mortality. Minimal long-term impacts as less susceptible gypsy moth species replace those species lost to gypsy moth-caused mortality. Different species composition and density will add variety to the landscape qualities of form, line, color and texture.
	4-6	Direct impacts to the visual resource as existing scenic values are maintained. Additional impacts to the visual resource from ground intervention tactics that employ physical means (traps, luretape). A continual need for intervention activities to maintain existing scenic values.

DECISION MAKING PROCESS FOR IMPLEMENTING THE SELECTED ALTERNATIVE

Specific decision matrices identifying tactics that could be used under various egg mass per acre levels for the management objectives of: (1) minimizing artificial spread, (2) minimizing natural spread, and (3) minimizing damage are being developed for the AIPM Program. These matrices will be subject to modification annually as new information becomes available. They will be presented in the annual Program of Work for AIPM and will describe actions that can be taken within the Project Area in a given year. The Program Manager and Project Leader will examine male moth and egg mass data in terms of the decision matrices and recommend actions to land managers. These recommendations will be used to initiate site-specific analyses which will be used in treatment decisions.

The survey and monitoring process established will identfy areas where a site-specific analysis is needed. The site-specific analysis will include:

1. A biological evaluation of the infestation to determine the probable gypsy moth population trend (building or declining) in the area.

2. An evaluation of site conditions in light of the available tactic(s) identified by the decision matrices. An interdisciplinary team will conduct this evaluation on National Forest lands and this approach will be recommended to other land managers. Each site is unique, however conditions that generally would be evaluated include: wildlife habitat including endangered, threatened or sensitive plant and animals and their habitat; amount, distribution and condition of gypsy moth susceptible trees and their economic value as well as their value to other resources; visual resources; land ownership and land use in and around the infestation; and topography as it is conducive to spread (ridgetop vs. valley).

The site-specific analysis will identify the potential adverse effects of the tactics that could be used. The significance of these effects will determine whether further documentation under NEPA is required. Because the AIPM Project Area is large and diverse both in ownerships and resources, it is anticipated that environmental assessments (EA's) will be prepared by each land managing agency if action is being considered on lands for which they are administratively responsible. Affected and interested publics will again be asked for input through the scoping process for developing EA's. Each agency will develop a range of implementable alternatives (including a "no action" alternative) that responds to issues surfaced during scoping, and are within the scope of options and constraints described under the selected alternative in this EIS. Once the site-specific alternatives have been developed the environmental consequences of each alternative will be analyzed. Implementable alternatives must be sensitive to environmental concerns, comply with the policies and/or management objectives of public land managing agencies, and provide for achieving AIPM objectives. Mitigating measures for these alternatives in addition to those listed in Chapter IV will be developed based on site-specific conditions.

Before an alternative is selected by the appropriate land manager, AIPM Program Manager and Staff will review the NEPA documents for all gypsy moth management action funded by AIPM in the Project Area. This will insure adherence to the policy and procedures outlined in the annual program of work and this EIS. In addition, this review will allow for an overview of all the projects proposed in the AIPM Project Area and an evaluation of the potential Project-wide or cumulative environmental impacts of all AIPM Projects. AIPM Program Manager or AIPM Staff can, as needed, coordinate any recommended changes with the appropriate land manager so the intended objectives are met while minimizing or reducing the overall potential environmental impacts. In general, it is desirable to use the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives.

MITIGATING MEASURES

As indicated in Chapter I, this EIS is not site specific. Additional site-specific analysis and NEPA documentation as appropriate will be conducted and tiered to this document. The site-specific analysis will be developed by the appropriate land managing agency, based primarily upon gypsy moth population data management objectives, on-site conditions and public input. A detailed biological evaluation of gypsy moth infestations will be a component of this analysis. Potential treatment sites within the AIPM Project Area would, depending upon the alternative selected in this EIS, include most susceptible forests, parks, recreation areas and forested urban/suburban areas. These sites could range in size from a few to several hundred acres, or in some cases, to several thousand acres.

The development of mitigating measures will vary, depending upon the intervention tactic(s) employed, application methods used, sensitivity of the Project Area and related site or stand characteristics. These site-specific mitigation measures and their anticipated effectiveness will be identified during the site-specific analysis.

In general, it is desirable to use the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives.

Operational

The following general mitigating measures apply to all alternatives that contain insecticides (NPV, *Bt* or diflubenzuron) intervention tactics:

1. Microbial (NPV and *Bt*) and chemical (diflubenzuron) insecticides will be applied following label directions.

   This ensures that appropriate precautions are taken to minimize human exposure to insecticides during mixing and loading operations; that insecticide applications are made under the supervision of a qualified applicator having EPA recognized certification; and that appropriate equipment is used to deliver the insecticides at recommended rates, at the proper stage of insect development, to maximize insecticide efficiency. In addition, label directions for diflubenzuron require that no direct applications will be made over open bodies of water or wetlands and that efforts are made to mitigate drift out of the target areas. Finally, it ensures that insecticides are properly stored and that empty containers are disposed of in the required manner which mitigates human exposure and environmental contamination.

2. Insecticides will be applied when the following meteorological conditions are present in the target area. This will mitigate insecticide drift, maximize deposition on target foliage and reduce run-off of the material.

   a. Wind speed in the target area cannot exceed 10 miles per hour.

   b. Application will be halted when air temperatures exceed 80 degrees Fahrenheit or when inversion conditions develop that would prevent insecticide deposition in the target area.

   c. Application will be suspended when the chance of rain is greater than 50 per cent. After rain, application will resume only when target foliage has dried.

3. All treatment areas will be delineated on USGS topographic maps which show forest cover, elevation contours, bodies of water, major streams and man-made structures such as roads, buildings and power lines.

   a. Treatment areas will be delineated on the maps in a manner that takes advantage of natural landmarks and facilitates treatment. Additional marking will be provided in the field by placement of helium filled balloons or other visible markers placed at strategic points.

   b. Buffer strips, inside or adjacent to treatment areas, will be delineated on maps and marked in the field as necessary, with balloons or other

visible markers of different colors from markers used to delineate treatment areas.

c. Maps showing various treatment blocks, buffers and exclusion areas will be provided to applicators for their review at least one day prior to application operations. Applicators will be briefed each day prior to the initiation of treatment operations.

d. Forest Service, Park Service or State personnel will monitor from the air or ground all applications. Radio equipment for air-to-air and air-to-ground communications is required.

e. Ground crews will be present for on site monitoring of insecticide deposition and drift detection monitoring during application.

f. Application of insecticides or other materials will be confined to daylight hours, when other meteorological and related conditions are favorable.

These application requirements will ensure that insecticides or other materials are applied to the intended areas, at appropriate times and under conditions that are as safe as possible. Additional criteria or requirements as may be needed will be incorporated into Project Work and Safety Plans.

4. Private property owners or managers that do not wish to have their land treated with insecticides will be excluded from the AIPM Project on request.

   In order to minimize unwanted insecticide exposure to humans, animals and property, objectors may request to exclude their property from such treatment. Exclusion from treatment should directly minimize insecticide exposure.

5. Buffer zones around no-treatment areas, including those of individual land owners in urban/suburban areas of the General Project Area who do not wish their land to be treated, will be established as needed.

   Size of buffer zones will be based on site conditions as well as the type of treatment being applied and method of application. Potential of drift onto nontarget locations will be minimized under this measure and should prevent unwanted exposure to Project objector's property.

6. Treatment of developed recreation areas (picnic areas and campgrounds) will be scheduled for low-use periods or will be temporarily closed during treatment. Such areas will be signed at least 24 hours prior to treatment operations.

   Scheduling treatment of recreation areas on low-use periods or the temporarily closure of areas will minimize human exposure to treatments. Signs posted in advance of treatment will provide information on scheduled treatment dates and type of treatment, providing the user with the opportunity to avoid or minimize exposure to treatments.

7. Streams, lakes, ponds or wetlands that meet one of the following criteria will have a buffer zone of a minimum of 200 feet when diflubenzuron is applied.

a. Water is not canopy covered. (Canopy covered here means overhanging crowns from adjacent vegetation effectively covers water surfaces).

b. Water is canopy covered and identified by the State as native trout water.

These buffer zones will either not receive treatment or receive a single or double application of Bt or Gypchek. Preventing application of diflubenzuron over these waters will reduce the potential for adverse effects on aquatic insects which reduces the likelihood that fluctuations in food supplies for native trout will occur.

The need for and development of additional mitigating measures for other trout waters will be established at the Project level through consultation with the appropriate State agency.

8. Aerial applications of intervention tactics for wilderness will be signed outside wilderness at major entry points prior to treatment. Intervention tactics in the treatment of insect pests are not expected in wilderness. As such, wilderness users may object to intervention while present in the area or after treatment. Signing of the area at major trailheads will inform users of the type of aerial intervention tactics to be applied and time span in which application may occur thus allowing the user to minimize or avoid exposure to the tactic. Wilderness will be signed at least one week prior to treatment.

9. Insecticides, to be effective should be applied as small (200 micron) or smaller droplets. As such, some drift off site is likely to occur. Drift of diflubenzuron will impact wilderness attributes should it drift into wilderness. To minimize these impacts, a buffer zone adjacent to and outside of wilderness will be established. This buffer zone will vary in size due to on-site conditions. The establishment of a buffer zone will serve to minimize effects caused by drift. Diflubenzuron may be used in the buffer zone to protect adjacent private land if the site-specific analysis determines that adequate protection is not possible by the use of or lack of availability of gypsy moth specific tactics or by the use of biological tactics.

10. Treatment of dispersed areas accessible by trails will be signed at all major points of entry. These major trailheads will be signed at least 24 hours prior to treatment operations. Signing of the area at major trailheads will inform users of the type of intervention tactic to be applied and time span in which application may occur thus allowing the user to minimize or avoid exposure to the tactic.

Additional mitigation measures will be developed in the site-specific NEPA documents that are applicable to the Project Area and intervention techniques proposed. These measures will be aimed at minimizing human exposure and environmental impacts from the insecticides applied.

Endangered and Threatened Species

Requirements and measures for activities affecting endangered, threatened, or proposed species are detailed in species recovery plans and in FSH 2609.23R. Recovery plans have been prepared for the American Peregrine Falcon, Bald Eagle,

Indiana Bat, Virginia Big-eared Bat, Flat-spired, Three-toothed Land Snail, Pink Mucket Pearly Mussel, and Tubercled Blossom Pearly Mussel.

A recovery plan is in preparation for the Virginia Northern Flying Squirrel. Chapters in FSH 2609.23R have been prepared for Bald Eagle.

This section lists those mitigating measures to be incorporated in developing AIPM demonstration project area plans when populations of endangered, threatened, or species proposed for listing (USDI F&WS; 50 CFR, Part 17) are encountered (see table III-3) and a determination is made through a biological evaluation that a species may be affected.

If an endangered or threatened species may be affected by AIPM decisions, evaluation criteria will be established in consultation with the US Fish & Wildlife Service and appropriate State agencies early in the process to determine (1) what (if any) additional information is needed and (2) what mitigation measures or course of action is most appropriate for conservation of species involved. Initiating agencies (USDA Forest Service on National Forests for example) of AIPM projects will be responsible for collecting additional information if needed.

Virginia Northern Flying Squirrel

A coordinated review of available intervention tactics including "no action" will be initiated through consultation with the US Fish & Wildlife Service and appropriate State agencies for populations in (1) the Stuart Knob area (Randolph County); (2) the Cheat Bridge area (Pocahontas and Randolph Counties); (3) the Cranberry area (Pocahontas and Greenbriar Counties) and, (4) the Spruce Knob area (Pendleton County) in West Virginia and; in Virginia, the Laural Fork area (Highland County). Effects will be evaluated at the site-specific project level. Destruction or adverse modification of critical habitat or actions likely to adversely affect the Virginia Northern Flying Squirrel will not occur as a result of the AIPM Program.

Virginia Big-eared Bat, Indiana Bat

A coordinated review of available intervention tactics, including "no action" will be made in consultation with the US Fish & Wildlife Service and appropriate State agencies for known colony sites in Randolph, Hardy, Pendleton, Grant, and Tucker counties in West Virginia and Highland, Bath and Shenandoah counties in Virginia. Effects will be evaluated at the site-specific project level. Destruction or adverse modification of critical habitat or actions likely to adversely affect Virginia Big-eared bat or Indiana bat will not occur as a result of the AIPM Program.

Bald Eagle

1. Aerial flights associated with AIPM projects will not be permitted within 1/4 mile horizontal distance and 500 feet vertical distance of an active nest.

2. Human entry during courtship, nest building, incubation or brooding periods will not be permitted within 1/4 mile horizontal distance of an active nest except under one of the following conditions (the US Fish & Wildlife Service and appropriate State wildlife agency shall be consulted in determining if any of these conditions exist):

   a. A reduction of a bald eagle nest management zone is permissible when a pair of bald eagles is determined to be tolerant of closer human

activity. New limits will be established in consultation with the US Fish & Wildlife Service and appropriate State wildlife agencies.

b. Research or management activities essential for the protection or continued survival of a bald eagle pair and their habitat must be implemented.

c. Topography or other characteristics of a nest site indicate an extension or reduction of a bald eagle nest management area.

Peregrine Falcon

Human activity within Peregrine management zones will be restricted to the degree necessary to protect nest sites (aeries). Restrictions will be established through consultation with the US Fish & Wildlife Service and appropriate State agencies at the site-specific project level. Destruction or adverse modification of critical habitat will not occur as a result of the AIPM Program.

Cheat Mountain Salamander, Shenandoah Salamander

A coordinated review of available intervention tactics including "no action" will be done in consultation with the US Fish & Wildlife Service and appropriate State agencies. This coordinated effort will be initiated for the area from McGowan Mountain extending to the north rim of the Blackwater River canyon, east to Dolly Sods, south to Spruce Knob, southwest to Thorny Flat and north through Barton Knob to McGowan Mountain in West Virginia and for known populations of Shenandoah Salamander in Virginia. Effects will be evaluated at the site-specific project level. Destruction or adverse modification of critical habitat or actions likely to adversely affect these salamanders will not occur as a result of the AIPM Program.

Flat-Spired, Three-Toothed Land Snail

Although little is known about the effects of chemical insecticides, or physiology or ecology of this snail, given what is known, diflubenzuron will not be available for gypsy moth control in the vicinity of Cheat River Gorge Overlook, Coopers Rock State Forest in Monongalia County, West Virginia. The limited habitat (approximately 2.5 square kilometers in size) and low but unknown population size dictate extreme caution when introducing chemical agents. Known populations of the flat-spired, three-toothed land snail will not be subjected to applications of diflubenzuron.

Madison Cave Isopod

A coordinated review of available intervention tactics including "no action" will be done in consultation with the US Fish & Wildlife Service and appropriate State agencies. Effects will be evaluated at the site-specific project level. Destruction or adverse modification of critical habitat or actions likely to adversely affect the Madison Cave Isopod will not occur as a result of the AIPM Program. Diflubenzuron will not be used for gypsy moth control in the ground water recharge area for Madison's Saltpetre Cave and Steger's Fissure in Virginia (portions of Augusta and Rockingham counties).

Plants (Swamp Pink, Running Buffalo Clover, Harperella)

A coordinated review of available intervention tactics including "no action" will be done in consultation with the US Fish & Wildlife Service and appropriate State agencies. This coordinated effort will be initiated for populations of swamp pink in

Augusta and Nelson counties (Virginia); populations of running buffalo clover in Fayette and Webster counties (West Virginia) and known populations of harperella in the AIPM Project Area. Effects will be evaluated at the site-specific project level. Destruction or adverse modification of critical habitat or actions likely to adversely affect these plants will not occur as a result of the AIPM Program.

Ground-applied intervention tactics require intensive application procedures, maintenance and follow up to check the adequacy of the intervention tactic. In areas where endangered or threatened (ET) plant species have been identified, ground-application tactics will avoid sites known to contain ET plants.

SENSITIVE SPECIES

Biological evaluations (FSM 2672.4) will be conducted as part of the site-specific analysis for known populations of sensitive species (see table III-4). Guidelines and additional mitigating measures will be developed at the project level through coordinated efforts of project initiating agencies, appropriate State agencies and in some cases, through consultation with the US Fish & Wildlife Service.

AFFECTED ENVIRONMENT

CHAPTER III

CHAPTER III

AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes present environmental conditions of the Project Area that may be affected by the alternatives. Environmental conditions are broadly grouped into these categories: Geology, Soils, Wetlands and Floodplains, Climate and Air Quality, Water, Vegetation, Wildlife and Wildlife Habitat, Fish and Aquatic Ecosystem, Threatened, Endangered or Sensitive Species, Visual Resource, Social and Economic Factors, Prime Farmland and Rangeland, Recreation and Cultural Resources. A more specific category, Wilderness, provides greater detail for parts of the environment for which there are specific management concerns in relation to the alternatives considered.

LOCATION

The Project Area straddles the Appalachian Mountains, south of the West Virginia/Pennsylvania border (figure I-1). It covers 12.8 million acres in all or portions of 18 counties of Virginia, and 20 counties of West Virginia (table III-1). Within the area are the George Washington, Jefferson, and the Monongahela National Forests, Shenandoah National Park, and Blue Ridge Parkway. The project involves privately owned and managed lands, and municipal, county, and State lands in addition to lands managed by Federal agencies.

This area was defined as the Project Area because it is generally limited in an east-west direction by the Appalachian Mountains. Also, male gypsy moth and egg-mass survey data were available so boundaries could be established. In reviewing this data, it was found that at least 50 percent of the area would contain gypsy moth populations which have the potential for increasing to defoliating levels within 3-5 years.

The southern boundary was established where male moths were no longer caught in State/Federal standard grid pheromone traps. Counties were included within the northern boundary to ensure that insect populations would be managed to reduce subsequent population pressures on the remainder of the area. Throughout the Project Area, forest types susceptible to the gypsy moth are present and continuous. These factors will permit AIPM personnel to determine forest impacts and the evaluation of applicable management practices.

PHYSICAL AND BIOLOGICAL SETTING

Geology, Soils, Wetlands and Floodplains

The Project Area lies within the Appalachian Physiographic Region, which is subdivided into physiographic provinces based on rock type and structure. The Blue Ridge, Ridge and Valley, and Appalachian Plateau Physiographic Provinces are within the Project Area.

The Blue Ridge Province contains mainly metamorphic and igneous rocks. These rocks are part of the Eastern Overthrust Belt which overlays the sedimentary rocks of the Ridge and Valley Province to the west. The area is characterized by broad ridges with low peaks, which are the result of differences in the weathering of various rocks. Mountain slopes are generally stony and steep.

The Ridge and Valley Province is heavily folded and faulted. The soils are derived from sedimentary rocks. Most residual soils are moderately deep and well drained, and have a fine, loamy texture. They are weakly structured and slightly erosive, with the exception of limestone-derived soils, which are well structured and highly erosive.

Table III-1.--AIPM Project Area counties

COUNTY	ACRES WITHIN PROJECT AREA
West Virginia	
Barbour	218,200
Fayette	424,300
Grant	305,900
Greenbrier	656,700
Hardy	374,400
Harrison	267,500
Marion	199,000
Mercer	266,800
Monongalia	233,500
Monroe	302,500
Nicholas	416,000
Pendleton	444,800
Pocahontas	603,500
Preston	412,800
Randolph	663,000
Taylor	111,400
Summers	223,800
Tucker	269,500
Upshur	225,300
Webster	352,600
SUBTOTAL	6,971,500
Virginia	
Albermarle	470,800
Alleghany	290,300
Amherst	306,200
Augusta	643,100
Bath	343,700
Bedford	482,600
Botetourt	348,500
Craig	211,100
Greene	100,400
Highland	266,100
Madison	205,900
Nelson	303,600
Page	200,300
Rappahannock	171,000
Roanoke	197,500
Rockbridge	389,400
Rockingham	557,400
Shenandoah	327,800
SUBTOTAL	5,815,700
TOTAL	12,787,200

The Appalachian Plateau Province is nearly horizontal rock strata. This province is characterized by broad, flat-topped ridges and narrow, V-shaped valleys. Soils of this province are similar to those of the Ridge and Valley Province. Some soils are derived from sandstones and shales and are deeper to bedrock. Colluvial soils are common.

There are wetlands and floodplains within the Project Area. Some fresh water wetlands can be found throughout the AIPM Project Area in Virginia and West Virginia. Wetlands, as referred to in this document, are defined (by Executive Order 11990) as: areas that are inundated by surface or ground water with frequency sufficient to support, and that under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Some 100-year flood plains occur in the AIPM Project. Flood plain, as used in this document, is defined (by Executive Order 11988), as: low land and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of off-shore islands, including at a minimum that area subject to a 1 percent or greater chance of flooding in any given year.

Climate and Air Quality

The climate, characteristically humid continental, is influenced by the mountain ridges. Precipitation varies across the Project Area from a low of 30 inches to a high of over 60 inches annually. Precipitation is well distributed throughout the year and occurs in the higher elevations on an average of 240 days per year. The average annual temperature is 45°F. Depending on elevation, aspect, and other site conditions, the growing season ranges from 140 to more than 200 days.

Water

The Project Area, lying astride the Eastern Continental Divide, is drained by the Ohio, James and Potomac river systems. Numerous rivers and streams flow within the Project Area, providing fish and wildlife habitat, recreation, agricultural, industrial, and municipal water supplies.

Vegetation

The Project Area contains heavily forested ridges with wooded areas in the intervening agricultural valleys. Forested areas within the Project Area range from remote Federally designated wilderness to forested residential lands. Timber stands are generally less than 90 years old, as a result of the widespread harvest that occurred in the early 1900's. Two major vegetation types, beech-birch-maple and oak-hickory dominate the area. White pine occurs on the lower slopes, and yellow pine occurs on the south and southwest slopes in the eastern portion of the Project Area.

Within the Project Area, the climate and physiography of the Appalachian Region support three major fuel types with differing burning characteristics. Burning characteristics of each fuel type depend upon a number of factors, such as weather (wind speed and direction, relative humidity, precipitation, temperature and atmospheric stability), topography (steepness of slope, aspect, and elevation), and fuels (moisture content, arrangement, compactness, size and shape, continuity and chemistry). The peak periods of fire occurrence are generally in the spring and fall, when

there is an abundance of fuel and low moisture content. Periodic droughts can either extend the fire seasons or initiate them earlier than normal. The primary cause of wildfires in the area are arson and debris burning. The major fuel types are:

1. Hardwoods and mixed hardwood-conifer types. This is the predominant forest cover type of the area and is best represented by oak-hickory stands. It can also include northern and mixed forest types. The fuel is primarily hardwood leaf litter and supports low fuel loads and low to high intensity surface fires.

2. Conifers and mixed conifer-hardwood types. This fuel type consists of an overstory of pine (white, pitch, table mountain and Virginia), spruce, fir, and hemlock. Hardwoods of various species may be present in the overstory, in the understory, or in both. Available fuels include hardwood leaf litter, needles, shrubs, and decaying woody material. The fuel load will support low to moderate-intensity surface fires, but in areas where downed material is concentrated, an intense fire can occur.

3. Logging slash associated with harvest cuts or heavy thinnings. This can include both hardwood and conifer stands. Fuels can include all material that has been cut down within the area. Intense fires can be expected if the slash is heavy, concentrated, and dry.

Wildlife and Wildlife Habitat

Appalachian Mountain ecosystems support a great variety of terrestrial and aquatic animal life. This variety reflects the wide range of climatic conditions, elevation, forest types, and successional stages in the Project Area. Wildlife species commonly found within the Project Area are listed in table III-2.

Fish and Aquatic Ecosystem

Coldwater and warmwater fisheries occur throughout the Project Area. Coldwater ponds and streams support populations of native brook trout. Both Virginia and West Virginia supplement this coldwater fishery with active put-and-take trout programs stocking rainbow, brown, and brook trout. Warmwater fisheries, the larger streams, rivers, lakes and ponds support smallmouth bass, largemouth bass, walleye pike, panfish, and catfish. Many nongame fish and other aquatic species are found within the Project Area.

Endangered, Threatened or Sensitive Species

The USDI Fish & Wildlife Service recognizes several plants and animals found in the Project Area as threatened or endangered (50 CFR 17.11, 17.12); (see table III-3 and Appendix B). The Virginia Commission of Game & Inland Fisheries, West Virginia Department of Natural Resources, USDI Fish & Wildlife Service and the USDA Forest Service have also identified several species found in the Project Area as sensitive (see table III-4).

Table III-2.--Wildlife species commonly found within the Project Area

Common Name	Scientific Name
White-tailed deer	*Odocoileus virginianus*
Eastern wild turkey	*Meleagris gallopavo*
Black Bear	*Ursus americanus*
Bobwhite quail	*Colinus virginianus*
Eastern mourning dove	*Zenaida macroura*
Pileated woodpecker	*Dryocopus pileatus*
Northern flicker	*Colaptes auratus*
Cottontail rabbit	*Sylvilagus floridanus*
Gray squirrel	*Sciurus carolinensis*
Fox squirrel	*Sciurus niger*
Ruffed grouse	*Bonasa umbellus*
American woodcock	*Scolopax minor*
Barred owl	*Strix varia*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethicus*
Gray fox	*Urocyon cinereoargenteus*
Red fox	*Vulpes fulva*
Bobcat	*Lynx rufus*

Thousands of other species of birds, mammals, reptiles, amphibians, and invertebrates also live in or near the Project Area.

Visual Resource

The Appalachian Mountains, Blue Ridge Mountains, and the Shenandoah Valley are renowned for their scenic beauty. Vast, diverse forested areas maintain a near-natural appearance, with man-made elements adding to the diversity of the landscape. The traveler sees spectacular and inspiring views from the Blue Ridge Parkway, Skyline Drive, interstate highways and other roadways as well as from the Appalachian Trail and other hiking trails. The most important factor in this visual resource is that of mountainous landforms, steep slopes and narrow winding valleys laced with mountain streams. Conspicuous rock forms and vegetative diversity provide a rewarding experience to the visitor.

Social and Economic Factors

Within the Project Area are small private holdings, particularly at lower elevations and in the forested lands between mountain ridges. Large forested acreages exist within the Project Area under Federal management. These include the Monongahela, Jefferson and George Washington National Forests, the Shenandoah National Park and Blue Ridge Parkway. Other forested areas are managed by private corporations, private nonindustrial landowners, the States of Virginia and West Virginia, and other Federal agencies.

Employment in the lumber and wood products industry has increased over the past 20 years, and efforts to enhance this industry and associated employment have been taken

by both states. In addition to agriculture and forestry, much of the economy has been dependent on energy resources and development. When energy production and development decline, decreases in associated manufacturing fields within the Project Area will also decline.

Typical of the Appalachian Region, this area is abundant in natural resources, but has historically lagged behind surrounding areas in economic growth. Recognizing this situation, Congress passed the Appalachian Regional Development Act of 1965. Per capita income is considerably less than the national average.

Parts of the area are rural residential land. Many people are moving in from urban areas, and second-home development is increasing. Long-term residents are more likely than newcomers to think of the forested areas as a source of employment. This is particularly true in the more rural portions of the Project Area, where unemployment tends to be high.

The Project Area is interspersed with small communities. Larger municipalities within the Project Area include Morgantown, Fairmont, Grafton, Bridgeport, Clarksburg, Salem, Buchannon, Elkins, Fayetteville, Oak Hill, Princeton, and Bluefield, West Virginia. The larger Virginia municipalities within the Project Area are Luray, Harrisonburg, Staunton, Waynesboro, Charlottesville, Lexington, Buena Vista, Bedford, and Roanoke.

Table III-3.--Federally endangered, threatened or proposed species known to occur within the Project Area

COMMON NAME	SCIENTIFIC NAME	*STATUS
Mammals		
Squirrel, Virginia N. Flying	Glaucomys sabrinus fuscus	E
Bat, Virginia Big-eared	Plecotus townsendii virginianus	E
Bat, Indiana	Myotis sodalis	E
Birds		
Falcon, American Peregrine	Falco peregrinus anatum	E
Eagle, Bald	Haliaeetus leucocephalus	E
Amphibians		
Salamander, Cheat Mountain	Plethodon nettingi	PT
Salamander, Shenandoah	Plethodon shenandoah	PE
Fish		
Logperch, Roanoke	Percina rex	PE
Snails		
Snail, Flat-spired Three-toothed Land	Triodopsis platysayoides	T
Clams		
Mussel, James River Spiny	Pleurobema (Canthyria) collina	E
Mussel, Tuberculed Blossom Pearly	Epioblasma t. torulosa	E
Mussel, Pine Mucket Pearly	Lampsilis orbiculata	E
Crustaceans		
Isopod, Madison Cave	Antrolana lira	T
Insects		
none		
Plants		
Swamp Pink	Helonias bullata	T
Running Buffalo Clover	Trifolium stoloniferum	E
harperella	Ptilimnium nodosum	PE

*Federal status from USDI Fish & Wildlife Service as of August 1988.

E - endangered
T - threatened
PE - proposed endangered
PT - proposed threatened

Table III-4.--State, Forest Service or U.S. Fish and Wildlife Service sensitive species within the Project Area not Federally listed or proposed.

COMMON NAME	SCIENTIFIC NAME	SOURCE*
Mammals		
Hare, Snowshoe	Lepus americanus virginianus	1
Shrew, Pygmy	Sorex hoyi (includes S. thompsoni)	1,5
Weasel, Least	Mustela nivalis	1
Shrew, Southeastern	Sorex longirostris	1
Shrew, Long-tailed	Sorex dispar	1,5
Shrew, Water	Sorex palustris	1,5
Cottontail Rabbit, New England	Sylvilagus transitionalis	1,5
Myotis, Keen's	Myotis septentrionalis	4
Bat, Small-footed	Myotis leibii	4,5
Bat, Rafinesque's Big-eared	Plecotus rafinesquii	5
Mole, Star-nosed	Condylura cristata	5
Woodrat, Eastern	Neotoma floridana	5
Vole, Rock	Microtus chrotorrhinus	5
Birds		
Heron, Great Blue (rookeries only)	Ardea heroides	4
Hawk, Coopers	Accipiter cooperii	1
Eagle, Golden	Aquila chrysaetos	1
Flycatcher, Alder	Empidonax alnorum	1
Wren, Bewick's	Thryomanes bewickii	4,5
Shrike, Loggerhead	Lanius ludovicianus	4,5
Sparrow, Bachman's	Aimophila aestivalis	5
Reptiles		
Turtle, Bog	Clemmys muhlenbergi	1
Turtle, Map	Graptemys geographica	1
Snake, Northern Pine	Pituophis m. melanaleucus	1
Rattlesnake, Timber	Crotalus horridus	5
Amphibians		
Hellbender	Cryptobranchus alleganiensis	5
Salamander, Tiger	Ambystoma tigrinum	2
Salamander, Green	Aneidas aeneus	1,5
Salamander, Spring	Gyrinophilus porphyriticus	5
Salamander, Pygmy	Desmognathus wrighti	1
Salamander, Shovelnose	Leurognathus marmoratus	1
Salamander, Thunder Ridge	Plethodon nettingi hubrichti	1
Salamander, Cow Knob	Plethodon punctatus	1,5
Salamander, Yonahlossee	Plethodon yonahlossee	1
Salamander, Shenandoah	Plethodon shenandoah	2
Salamander, Peaks of Otter	Plethodon hubrichti	6
Fish		
Sculpin, Bluestone	Cottus sp.	5
Darter, Sharphead	Etheostoma acuticeps	1
Darter, Tippecanoe	Etheostoma tippecanoe	1
Shiner, Roughheaded	Notropis semoeraspger	1

Table III-4.--State, Forest Service or U.S. Fish and Wildlife Service sensitive species within the Project Area not Federally listed or proposed (continued).

COMMON NAME	SCIENTIFIC NAME	SOURCE*
Madtom, Orange-Fin	*Noturus gilberti*	1
Logperch, Blotchside	*Percina burtoni*	1
Dace, Redside	*Clinostomus elongatus*	4
Shiner, Popeye	*Notropis ariommus*	4
Minnow, Kanawha	*Phenacobius teretulus*	4,5
Minnow, Cheat	*Rhinichthys bowseri*	4,5
Darter, Finescale Saddled	*Etheostoma osburni*	4,5
Darter, Longhead	*Percina macrocephala*	4,5
Insects		
Mayfly, West Virginia burrowing	*Ephemera triplex*	5
Dragonfly, Alleghany snaketail	*Ophiogomphus incurvatus alleghen.*	5
Beetle, Ground	*Sphaeroderus schaumi ssp.*	1
Beetle, Six-banded Longhorn	*Dryobius ocxnetatus*	5
Beetle, Maureen's Minute Moss	*Hydraena maureenae*	5
Beetle, American Burying	*Nicrophorus americanus*	5
Beetle, Black Rove	*Lordithon niger*	5
Moth, Marbled Underwing	*Catocala marmota*	5
Moth, Precious Underwing	*Catocala pretiosa*	5
Moth, Hebard's Nocutid	*Erythroecia hebardi*	5
Butterfly, Tawny Cresent	*Phyciodes batesi*	5
Butterfly, Regal Fritillary	*Speyeria idalia*	1,5
Moth, Chestnut Clearwing	*Synanthedon castaneae*	5
Crustaceans		
	Apochthonius paucispinosus	3
Crayfish, New River Riffle	*Cambarus chasmodactylus*	5
	Cambarus nerterius	3
	Caecidotea cannulus	4
	Caecidotea siminni	4,3
	Caecidotea sinuncus	4,3
	Chitrella regina	3
	Colias interior	3
	Fontigens holsingeri	4,3
Cavesnail, Organ	*Fontigens tartarea*	4,3
	Fontigens turritella	3
	Islandiana speophila	3
	Kleptochthonius orpheus	3
	Kleptochthonius hetricki	3
	Kleptochthonius henroti	3
	Plusiocampa sp 1	3
	Pseudanophthalmus hadenoecus	4,3
	Pseudanophthalmus montanus	4
	Pseudanophthalmus subequalis	3
	Pseudanophthalmus p. potomaca	3
	Pseudanophthalmus potomaca senecae	3
	Pseudanophthalmus krekeleria	3
	Pseudanophthalmus lallemanti	3

Table III-4.--State, Forest Service or U.S. Fish and Wildlife Service sensitive species within the Project Area not Federally listed or proposed (continued).

COMMON NAME	SCIENTIFIC NAME	SOURCE*
	Pseudosinella certa	4,3
Millipede, Greenbriar Valley Cave	Pseudotremia fulgida	4,3
	Pseudotremia lusciosa	4,3
	Pseudotremia princeps	4,3
	Sphalloplana culveri	4,3
Isopod, Burnsville Cove cave	Stygobromus conradi	5
Isopod, Morrison's Cave	Stygobromus morrisoni	3,5
Amphipod, Bath County Cave	Stygobromus mundus	2,5
	Stygobromus redactus	3
	Stygobromus allegheniensis	3
Amphipod, Minute Cave	Stygobromus parvus	4,3
	Stygobromus nanus	4,3
	Trichopetaium krekeleri	4,3
Plants		
White Monkshood	Aconitum reclinatum	4
Wild Onion	Allium oxyphilum	4,5
Shale Barren Rockcress	Arabis serotina	1,2,5
Pirate Bush	Buckleya distichophylla	1,2
Reed Grass	Calamagrostis porteri	4
Variable Sedge	Carex polymorpha	4,2,5
Grape-Stemmed Leather-Flower	Clematis viticaulis	1
Dwarf Dogwood	Cornus canadensis	1
Fraser's Sedge	Cymophyllus fraseri	1
Showy Lady's Slipper	Cypripedium reginae	1
Umbrella Leaf	Diphylleia cymosa	1
Spotted or Nodding Mandarin	Disporum maculatum	1
Woodland Horsetail	Equisetum sylvaticum	1
Yellow Buckwheat	Eriogonum alleni	4
Darlington's Purge	Euphorbia purpurea	4,2,5
Virginia Sneezewood	Helenium virginicum	1,2
Swamp Pink	Helonias bullata	1
White Alumroot	Heuchera alba	1
Long-stalked Holly	Ilex collina	1,5
Large-spored Quillwort	Isoetes macrospora	1
Gray's Lily	Lilium grayi	1
Highland Rush	Juncus trifidus ssp.	4
Fir Clubmoss	Lycopodium selago	1
Barbara's Buttons	Marshallia grandiflora	4,5
Interrupted Royal Fern	Osmunda ruggii	1
Canby's Mountain Lover	Pachistima canbyi	4,5
Ginseng	Panax quinquefolium	1
Mainden Cane Panic	Panicum hemitomon	1
Sworleaf Phlox	Phlox buckleyi	4
Jacob's Ladder	Polemonium vanbruntie	4,5
Three-toothed Cinquefoil	Potentilla tridentata	1
Roan Mountain Rattlesnake-root	Prenanthes roanensis	1
Gray's Saxifrage	Saxifraga caroliniana	5
Northeastern Bulrush	Scirpus ancistrochaetus	1,2

Table III-4.--State, Forest Service or U.S. Fish and Wildlife Service sensitive species within the Project Area not Federally listed or proposed (continued).

COMMON NAME	SCIENTIFIC NAME	SOURCE*
Hearted-leaved Skullcap	Soutellaria ovata pseudoarguta	5
Virginia Spirea	Spiraea virginiana	4
Mountain Pimpernell	Taenida montana	5
Steele's Meadow-rue	Thalictrum steeleanum	2,5
Kate's Mountain Clover	Trifolium virginicum	1,5
Dwarf Trillium	Trillium pusillum	1,5
Large Cranberry	Vaccinium macrocarpon	1
Turkey Beard	Xerophyllum asphodeloides	1

*Where sensitive species status, originated from:

Code

1 - USDA Forest Service (R-8)
2 - Virginia Department of Agriculture and Consumer Services
3 - West Virginia Department of Natural Resources
4 - Proposed USDA Forest Service (R-9)
5 - USDI Fish & Wildlife Service
6 - USDI National Park Service

Prime Farmland and Rangeland

Land use within the Project Area is primarily agriculture and forest oriented. Areas dominated by agriculture use contain crop and pasture land; dairy, beef and horse farms; sheep, poultry and other small animal production; and other agricultural activities. Abandoned and working orchards are scattered throughout the Project Area.

Recreation

Recreation has become an important part of the economic picture. Within the Project Area, a wide spectrum of recreational opportunities is available to much of the Mid-Atlantic area. One-fifth of the nation's population is located within a day's drive of the area. Recreational opportunities are being provided by the public and private sectors. Dispersed recreational activities such as fishing, hunting, hiking, canoeing, bird watching, primitive camping, and horseback riding are being provided primarily by the three National Forests (Monongahela, Jefferson, and George Washington) and Shenandoah National Park (with the exception of hunting in the park). The Appalachian National Scenic Trail, a resource of national significance, traverses the AIPM Project Area from north to south. Developed recreational sites on Federal lands provide numerous opportunities for activities such as family camping, picnicking, swimming, and boating. Interpretation services and commercial facilities are provided by public and private sectors. Caverns, ski areas, developed RV parks, historic sites, lodges and restaurants are but a few examples of attractions provided by the private sector. Tourism is being actively promoted within the area by local and State governments as well as by private sectors and is becoming a major source of revenue. Projected recreation demand figures show a rising trend for all types of recreational facilities (Commonwealth of Virginia 1984).

Cultural Resources

Evidence indicates that human occupation of lands within the AIPM Project Area began at least 12,000 years ago (USDA, George Washington National Forest FEIS, 1986, USDA, Jefferson National Forest FEIS, 1985, USDA, Monongahela National Forest FEIS, 1985). Prehistoric cultural remains have been documented from the Paleo-Indian, Archaic, Woodland, and Protohistoric Periods.

European exploration of the Region began in the second half of the seventeenth century and settlement of the area began in the early to mid-eighteenth century. The historic period includes activities related to lumbering, mining and farming. Numerous historic site types are found throughout the area and include cabins, farmsteads, mines, graves, Civil War sites, iron furnaces and CCC camps.

WILDERNESS

The AIPM Project Area includes 15 wildernesses. Included with the wildernesses is Shenandoah National Park's "Natural Zone" (81,257 acres), Blue Ridge Parkway's "Natural Zone" (4,700 acres) and a section of the Appalachian National Scenic Trail between Jarman Gap and Rockfish Gap (approximately 1,500 acres) which, for the purposes of this EIS, will be considered and discussed as a wilderness. The total acreage of wilderness and "natural area" is approximately 276,815 acres, or 2 percent of the total Project Area (only 4,025 acres of the Mountain Lake Wilderness is included due to project boundaries). (See table III-5 and figure III-1).

Based on the Wilderness Act's definition of wilderness, the Forest Service describes the four attributes of wilderness as: (1) natural integrity; (2) apparent naturalness; (3) outstanding opportunities for solitude; and (4) opportunities for primitive recreation. The Forest Service describes two additional attributes. One is a supplemental attribute composed of outstanding ecological, geological, and historical features. The other attribute is the scenic values contributed by the natural features of the area. They are supplemental because they may be present, but they are not required by the Wilderness Act.

Each wilderness attribute evaluation is based on specific criteria. For example, natural integrity is based on impacts of human activity in each area. Solitude is based on factors such as screening by trees or other plants and the evidence of human presence. Boulders or other landforms also provide acceptable screening, as does size of area. See Appendix A for discussion of attributes of each wilderness.

Natural Integrity

Natural integrity is the extent to which long-term ecological processes are intact and operating. This attribute describes the extent to which human influences have altered natural processes. The present state of the area is compared with conditions which have no visible human impacts. This attribute is based on how human influences, such as vegetation manipulation, have altered natural conditions. With time, these altered conditions will not be evident to most people.

Vegetative manipulation can include timber harvesting and forest management treatments such as hardwood control. Fire history includes signs of fire used to control hardwoods, snakes, and ticks.

Apparent Naturalness

Apparent naturalness is closely related to natural integrity. Both qualities are altered by the same activities. Apparent naturalness focuses on how the general public perceives the activities. The term includes "natural" aspects that are seen, heard, or smelled.

Outstanding Opportunities for Solitude

Solitude is isolation from sights, sounds, and the presence of others. Human development and evidence do not appear. Features that contribute to solitude are size of area and distance from perimeter to center. Vegetation and topographic screening are also related to solitude.

Opportunities for Primitive Recreation

Primitive recreation provides opportunities for isolation from the evidence of humans. A vastness of scale exists in most of these areas. Visitors feel they are a part of the natural environment. They may enjoy a high degree of challenge and risk and use of outdoor skills. One meets nature on its own terms, without comfort or convenience facilities.

Supplemental Wilderness Attributes

The Wilderness Act states that an area may also contain special ecological and geological features. Other scientific, educational, scenic, or historical features may also be present.

Ecological Features. This attribute includes threatened or endangered species of animals and plants and old growth trees. Other special ecological features may also exist.

Special Geological Features. This attribute offers landforms that represent significant examples of geological processes.

Cultural and Historical Features. These resources comprise all evidence of historic and prehistoric human use of an area. They include petroglyphs and pictographs (ancient carvings on rocks). Trails as well as historic sites may exemplify the development of an area. Examples include pioneer homesteads, evidence of early logging or mining, and trade or military routes.

Scenic Values

Scenic values are based on significant visual qualities of the natural landscape in the wilderness. Natural features that contribute to the scenic qualities are land forms, rock forms, plants, and water (lakes and streams). The unique qualities of these natural features depend on how unusual, outstanding, and uncommon they are.

The characteristic landscape in wilderness is in ecological succession and should be accepted as such. Although it may be a beautiful landscape now, it can change because of catastrophic events such as fire, storms, and insects or diseases. Natural ecological processes create the diversity in flora and fauna desirable in wilderness. Visual quality and scientific value are by-products achieved under the landscape management objectives of preservation.

Table III-5.--Wilderness and natural zones with AIPM Project Area

WILDERNESSES		ACRES
George Washington National Forest		
Ramseys Draft		6,725
St. Marys		10,090
Rich Hole		6,450
Rough Mountain		9,300
Monongahela National Forest		
Cranberry		35,864
Otter Creek		20,000
Dolly Sods		10,215
Laurel Fork North		6,055
Laurel Fork South		5,997
Jefferson National Forest		
James River Face		8,903
Thunder Ridge		2,450
Shawvers Run		3,665
Barbours Creek		5,700
Mountain Lake		4,025
Shenandoah National Park		
Shenandoah		53,919
Shenandoah Natural Zone		81,257
Blue Ridge Parkway		
Blue Ridge Natural Zone		4,700
Appalachian National Scenic Trail (Jarman Gap to Rockfish Gap)		1,500
	TOTAL	276,815

AIPM PROJECT AREA WILDERNESSES

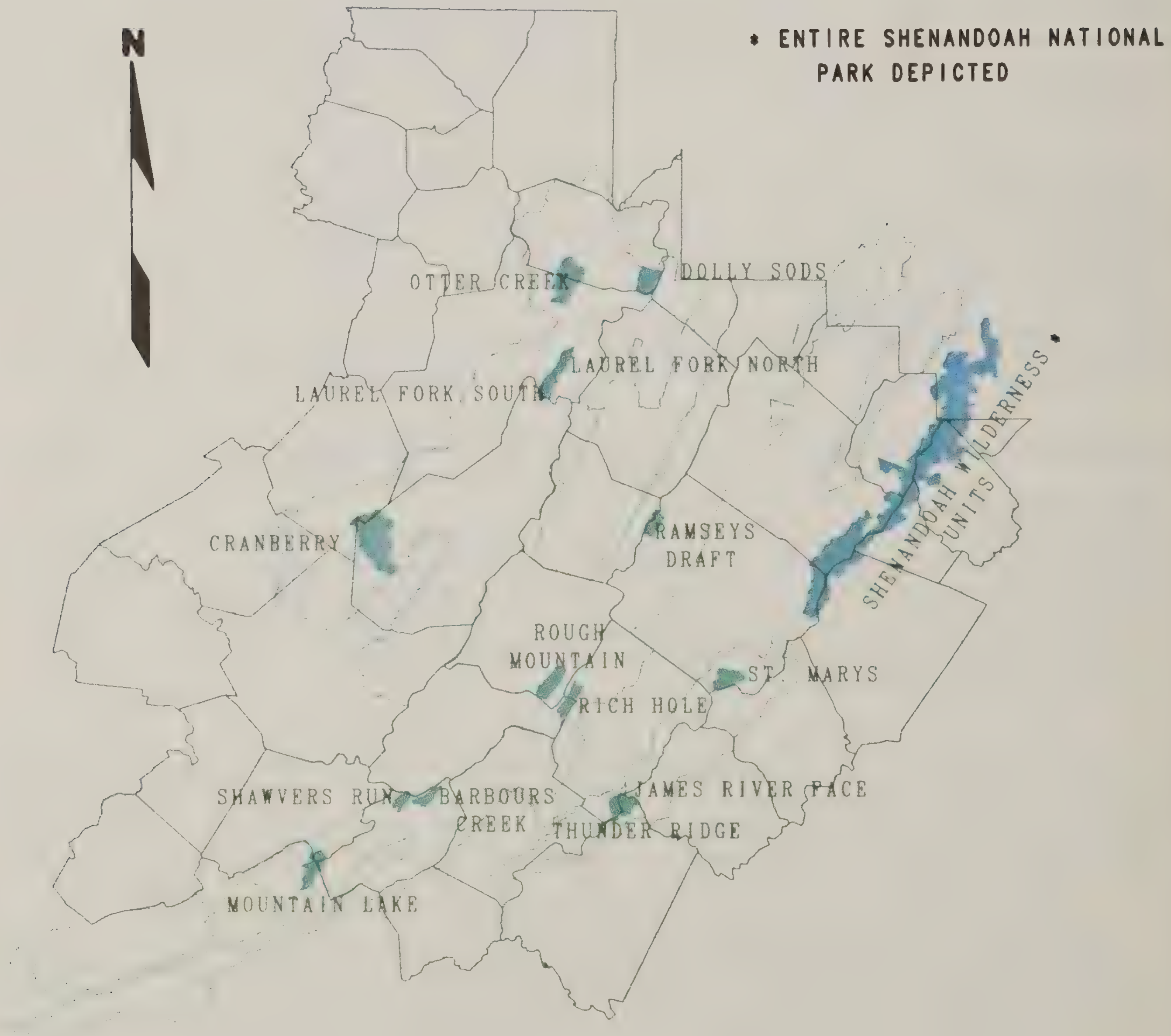

FIGURE III-1.- THE PROJECT AREA INCLUDES 15 WILDERNESSES IN WEST VIRGINIA AND VIRGINIA.

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

Gypsy moth caterpillars, pupae and adult moths

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

Page

INTRODUCTION

This chapter discusses the potential environmental consequences of each alternative considered in detail on the environment within the AIPM Project Area. The information may be used to compare the alternatives using the existing conditions (alternative 1, no action) as a baseline. A summary of the environmental consequences by alternatives is contained in Chapter II (table II-4). The analysis was derived from the environmental conditions presented in Chapter III and from resource data, research findings and related information.

The alternatives were analyzed to determine the potential effects on the following environmental elements:

- vegetation
- insects
- fish and aquatic ecosystems
- water quality
- visual resource
- cultural and historical resources
- socio-economic effects
- wetlands and flood plains
- wilderness
- wildlife and wildlife habitat
- endangered, threatened and sensitive species
- soil
- air quality
- recreation
- public health
- prime farmland and rangeland
- consumers, civil rights, minority groups and women

The estimated direct, indirect and cumulative effects of the alternatives are discussed. Direct effects are those caused by the action and occur at approximately the same time and place. Indirect effects are also caused by the action, but occur later in time or farther removed in distance, but are still reasonably foreseeable Cumulative effects develop from repeated use of an action or intervention component on the resource when added to other past, present, and reasonably foreseeable future actions. These effects may build up over time and throughout a given area.

ALTERNATIVE I (No Action)

Alternative 1 represents the no action alternative required by CEQ regulations. The intervention phase of the AIPM Demonstration Project would not be implemented. Funding for AIPM would not continue or be limited to monitoring only. State/Federal cooperative gypsy moth suppression and eradication programs would continue as needed on State and private lands in Virginia and West Virginia. These cooperative programs are funded with up to 50 percent Federal funds and 50 percent State and local funds (county or city). Similarly, normal suppression on National Forest lands and National Park lands could also be implemented as gypsy moth populations build to defoliating levels within the area of the proposed project. These projects would be Federally funded. The short-term objectives of such suppression would be to prevent excessive defoliation and tree mortality, and to reduce insect populations in selected high-value, suburban/urban areas and high-use recreation areas. Environmental impacts of this suppression are covered in the 1985 Gypsy Moth Suppression and Eradication Projects Final Environmental Impact Statement, as Supplemented. Annual site-specific environmental analysis would further consider the expected environmental impacts of the annual projects in detail. Although action could be taken by State and Federal agencies to suppress heavy populations in selected high value areas, most of the infested areas would not be treated, and the natural spread of the insect throughout the proposed project area would continue unabated. At the most southern portions of the proposed AIPM project area, isolated infestations could be treated as a cooperative State/Federal eradication project.

State or private areas that would not be treated under normal State/Federal suppression projects would be those areas that do not meet State criteria. These criteria are generally based on gypsy moth population levels, resource values, or residential or recreation values at risk. Regardless of values, areas having light populations are not generally treated under normal suppression.

Forest landowners, depending upon their management objectives, may decide to suppress potentially damaging gypsy moth populations at their own expense to prevent excessive tree mortality. Others may decide to implement silvicultural treatments as described in Chapter II (Gottschalk 1987).

Suppression on National Forest land is subject to similar criteria and must comply with Forest Land and Resource Management Plans (LRMP), objectives, and policy. Suppression action would be aimed at protecting those areas having high resource values and heavy gypsy moth population levels. Areas that would be excluded from suppression would be low value forest stands or areas with light gypsy moth populations. Threatened or endangered species habitat areas and other sensitive areas would not be treated unless gypsy moth threatened destruction of sensitive habitat and treatment could be sufficiently mitigated. Thus, under alternative 1, much of the State, Federal, and private land in the proposed AIPM project would not receive treatment, and the natural spread of the insect would not be slowed.

Vegetation

Under this alternative, the gypsy moth would be allowed to infest and become a permanent component of the ecosystem in forested areas where no suppression action would be taken by State or Federal agencies. In areas that would not qualify for action under the current suppression/eradication programs, which as discussed above, would be much of the AIPM Project Area, insect populations could build to high levels and then collapse, a cycle which normally occurs over several years.

Untreated forest stands would be those of low to moderate resource values, as defined by National Forest LRMP's, or by land managers and landowners, low to moderate site productivity, inaccessible high to low value stands, or those of non-host type, such as stands of pine or yellow poplar.

In susceptible untreated areas, the direct effects on vegetation would vary from site to site, depending upon the amount and condition of susceptible trees in the area. Generally, sites having a high oak component (greater than 80 percent) would be more impacted and experience heavier defoliation, reduced growth rates, and greater tree mortality than sites having fewer oaks. The cumulative effect would be a gradual change in forest tree species. Depending on the site, many susceptible oaks may be gradually replaced by less susceptible tree species such as yellow poplar, ash, pine and red maple. In lightly defoliated areas, no noticeable changes may occur.

Herrick and Gansner (1988) published information regarding changes in forest condition as a result of gypsy moth defoliation. Data was collected from 574 randomly established plots throughout central Pennsylvania over a seven year period. Plots were established in the leading edge of gypsy moth infestation in 1978, in forest stands of varying site indexes and varying species compositions. The severity and frequency of gypsy moth defoliation varied from plot to plot but, in general, was most severe in 1980, 1981, and 1982. None of the plots were sprayed, thinned, or cut during the seven-year study period. Results of the study showed changes in the numbers of trees per acre. The number of trees greater than 3 inches in diameter at breast height (dbh) increased on one-third of the plots; 55 per cent of the forest plots had fewer trees than before the outbreak. One-tenth of the plots had

reductions of more than 25 percent and on a few plots more than half the trees died. Before the gypsy moth outbreak, oaks averaged about 59 square feet (68 percent) of basal area per acre. By 1985, oak basal area was down to 55 square feet (63 percent) per acre, less than two-thirds of total stocking. Oaks are still the major component of these forests, but species less susceptible to gypsy moth defoliation, such as red maple, black gum, ash, and yellow poplar make up a greater portion of average stocking now than in 1978.

In a study reported by Quimby (1987), the progression of the gypsy moth and its effect on forest stands were measured annually on 57 permanent plots over a ten year period. Average oak mortality figures for the plots were: after one year of defoliation--18 percent, after two years of defoliation--89 percent, after three years of heavy defoliation--98 percent. Overall mortality in these stands ranged around 14 percent for one year of defoliation, 38 percent for two years of defoliation, and 48 percent for three years of defoliation. Quimby indicated that the data represents a worst-case situation.

Since it is probable that only high value forest stands, recreation areas, and forested residential areas would be treated under this alternative, timber mortality results similar to those described in the foregoing study could occur in untreated areas.

If extensive mortality occurs as a result of a gypsy moth infestation, major reductions in forest canopy could cause effects to the area in both the short and long term. Mortality of older trees would allow more sunlight to reach the forest floor. This would encourage seed germination and growth of seedlings and other herbaceous vegetation. Seeds of species such as beech, birch, maple, cherry, yellow poplar and ash remain in the duff of the forest floor from one to seven years (Frank 1982). When the overstory trees are removed or die, dormant seed will germinate to establish reproduction. Competition will increase as these seedlings occupy the forest floor. Grasses, forbs and woody shrubs, such as huckleberry and laurel, will also compete for available moisture and nutrients. Since oak seedlings grow slower than other tree species, many will be quickly overtopped. Consequently, on some sites there will be fewer oaks in the future forest. Also, gypsy moth defoliation generally eliminates acorn production, and few sprouts will develop from the root systems of oaks that have been repeatedly defoliated because food reserves have been depleted (Frank 1982).

Another potential indirect effect on vegetation is wildfire hazard and difficulty of control. In the short term, there could be a significant increase in the amount of fuel (twigs, limbs and standing dead trees) available for wildfires as a result of gypsy moth-caused tree mortality. This fuel could cause a wildfire to spread faster, and if standing dead trees caught fire, would make control much more difficult. In addition, wildfire under these conditions would be detrimental to the oak reproduction that was present and further enhance the herbaceous plants and light-seeded tree species.

Wildlife and Wildlife Habitat

Wildlife are dependent upon their habitat. If gypsy moth outbreaks occur, changes in wildlife habitat (see preceding discussion on potential changes in vegetation), will cause changes in wildlife abundance, distribution and animal community composition. Wildlife responses to these changes can be grouped into three general categories:

1. Response to changes in vegetative structure

2. Response to changes in food supply and

3. Response to indirect effects.

In addition, these three categories are different in terms of response when viewed from a short- or long-term perspective. The degree to which animals are impacted depends upon the species being evaluated. In reviewing the following description of effects, it is important to remember that no wildlife populations are known to be at risk from gypsy moth infestations.

Immediate effects of significant defoliation are associated with temporary elimination of forest canopy and ground cover foliage. Wildlife that feed, rest, nest or escape in forest vegetation may disperse to adjacent suitable habitat. Birds which feed from exposed perches or are accustomed to open habitats are attracted to recently defoliated areas (Cooper et al 1987; DeGraaf and Holland 1978).

Wildlife opportunistic in feeding habits visit areas with high gypsy moth populations more often (Blumenthal 1979; Smith and Campbell 1978; Inozemtsev et al 1980).

Long-term effects of repeated defoliations on vegetative structure usually results in an increase in habitat diversity (i.e., more standing snags, increased ground cover, increased habitat patchiness, and a more diverse plant community). Availability of habitat for high-canopy nesters decreases, while habitat increases for secondary-cavity nesters in areas with significant tree mortality (Cooper et al 1987). Cooper et al (1987) conducted field studies in West Virginia from 1984-1986, and attempted to model the changes in bird communities in response to gypsy moth defoliation and mortality. Some of the results of this study follow:

-- At pre-outbreak levels, many bird species were observed eating gypsy moth larvae, but only the yellow-billed cuckoo seemed to feed preferentially on gypsy moth. Other birds observed feeding on larvae were great-crested flycatcher, black-capped chickadee, tufted titmouse, white-breasted nuthatch, wood thrush and rufous-sided towhee. These species are likely to eat gypsy moth larvae at any gypsy moth density, but at pre-outbreak levels, the gypsy moth is mostly an incidental food item.

-- At outbreak levels, food supplies for insectivores increase until insect prey availability responds to effects of severe defoliation (more than 50 percent). Some species are able to take advantage of gypsy moth as a new food source, others will not. Birds alter foraging patterns and concentrate on trees that are not preferred hosts of gypsy moth. Birds were not observed to abandon defoliated areas entirely.

-- In general, gypsy moth defoliation-caused effects on various bird species are short-lived unless severe tree mortality occurs.

Over a period of time, these changes are likely to directly affect bird communities. Several investigations have shown that many bird species have definite foraging preferences for certain species of trees (Holmes and Robinson 1981, Robinson and Holmes 1984). Holmes, et al. (1986) showed that in a 16-year study of a New Hampshire forest, population fluctuations in some bird species coincided with changes in tree species composition. Increases in low and bark foraging, low and cavity nesting and open habitat bird species are associated with areas of high mortality.

Overall, tree mortality should increase habitat variability, resulting in increased bird species richness.

Defoliations cause oak and other trees to abort hard mast crops (Fedde 1962; Liseinsky 1984). Animals that utilize fall mast crops in defoliated areas shift to secondary food items or relocate. Long-term effects of repeated defoliations usually result in an increase in the diversity of tree species (food sources) when forested areas recover (Cooper et al 1987; Hayden 1987). Fewer oak trees as a result of high mortality, however, would produce a proportionately lower volume of acorns per forested area. Even in areas without high oak mortality, reduced acorn crops are more likely following severe defoliations (Feede 1962).

Squirrels and other small game respond similar to songbird populations. They tolerate defoliation, some may disperse and all will become more susceptible to predation until refoliation occurs. Squirrels may disperse for longer periods of time (one year or longer), due to aborted mast crops in defoliated areas. Long-term effects due to composition changes in tree species, however, may actually benefit squirrels as a result of mixed tree species composition and more stable annual supplies of foods able to be stored for winter (Nixon, 1987).

Increased insect availability following years of significant defoliation (if tree mortality occurs) benefits ground-feeding birds, other insectivorous species (shrews, songbirds) and some omnivorous species such as rodents, opossum, skunk and raccoon (Hayden 1987, Smith 1985, Cooper et al 1987). Grouse habitat improves for breeding, nesting, feeding and brood cover as stem densities in lower canopy and ground vegetation increase. In addition, increases in numbers and density of standing snags may provide more nesting habitat for primary cavity nesters (woodpeckers) and more dead and down woody material used for cover of forest floor-dwelling animals (voles, mice, salamanders, etc.).

Animals with large home ranges (greater than one square mile), such as white-tailed deer, black bear and wild turkey, are not directly affected by gypsy moth defoliations in the short term, although deer and bear are likely to avoid recently-defoliated areas when searching for food. Turkey (especially broods) are more likely to frequent edges of defoliated areas due to increased insect availability. Over the long term, changes in stand composition and vegetative structure of repeatedly defoliated stands (if significant mortality occurs) provide increased variety of food supplies for deer and turkey, and improved brood cover for turkey (Hayden, 1987).

Insects

As the gypsy moth spreads into new areas of the AIPM Project in Virginia and West Virginia, the insect will compete for food with native defoliating insects. Outbreak populations of these native Lepidopteran insects have in the past caused heavy defoliation and some tree mortality of hardwood trees located within the AIPM Project or in adjacent states. It is not uncommon to find several species of native defoliators, such as forest tent caterpillar, spring and fall cankerworms, leaftiers and spanworms, inhabiting the same hardwood stand infested with the gypsy moth. Such combinations often result in very heavy defoliation of a hardwood stand. Most of the common native defoliators by themselves seldom build to outbreak populations and remain at near outbreak levels for more than one or two years before collapsing again to low levels. The period between such native outbreaks is often 10, 15 or more years in a given area.

Since many of the native insects that occur within the AIPM Project Area also occur throughout the hardwood regions of the Eastern United States, and continue to occur in hardwood areas already infested by the gypsy moth, long-term direct, indirect or cumulative impacts on many of these insects are expected to be minimal. However, there undoubtedly will be some exceptions, especially with some giant silkworm species that may be temporarily eliminated from some localized areas. The life cycle of many of these Lepidoptera may coincide with that of the gypsy moth in that the larval stages are feeding on hardwood foliage in the spring at or about the same time as the gypsy moth. Most of these insects have only one generation per year in the northeastern United States; others have more than one generation in the South which may require a longer period of time for these insects to recolonize defoliated areas.

Numerous species of butterflies occur within the project area and many are known to inhabit hardwood forests, others in stand openings and others in very restricted habitats such as shale barrens, limestone barrens, sandstone barren ridgetops and wetlands. There are six Lepidoptera species listed as sensitive (table III-4) that may be directly impacted through competition for food and habitat by the gypsy moth.

There are other native insect species that occur in the hardwood forests within the AIPM Project Area that may be directly or indirectly impacted by the gypsy moth under this alternative. Insects that feed on flowers, foliage or seeds of oaks or other hardwoods defoliated by the gypsy moth would be affected by the gypsy moth since defoliation often eliminates the flowers and seeds of host trees. On the other hand, if oaks are replaced, other insects will benefit. Native ground beetles, ants and spiders may be positively impacted by the gypsy moth, providing additional prey for these insects. Wild bee colonies that occur within heavily defoliated areas may also suffer, depending upon the availability and distances to other sources of flowering trees, shrubs and grasses.

Lepidoptera populations may experience higher mortality rates due to elevated populations of gypsy moth parasites and predators.

Endangered, Threatened and Sensitive Species

The American peregrine falcon is not directly affected by gypsy moth but may find prey more readily available in defoliated areas. The bald eagle is not directly affected by gypsy moth. However, adequate information is not available on effects of defoliation during critical periods of the nesting cycle most likely to occur at times of peak defoliation (incubation and brooding).

Habitat quality for the Virginia northern flying squirrel (mature spruce, fir or mixed hardwood spruce/fir forest; Wells-Gosling and Heaney 1984) may be reduced from gypsy moth defoliation(s).

Although Virginia big-eared bat and Indiana bat colonies are not known to be affected by significant defoliations, foraging habitat for Virginia big-eared bat and Indiana bat may be adversely affected due to defoliation (see effects on insects for alternative 1). If present, Virginia big-eared bats and Indiana bats may frequent the edge of defoliated areas and crowns of trees within defoliated areas in search of prey, however gypsy moths are unavailable as a food source for bats. Indiana bats may benefit from tree mortality by utilizing exfoliating bark of standing snags as summer roosts or maternity colonies. Keen's myotis and eastern small-footed bat behavior in response to the gypsy moth are thought to be similar.

Effects of gypsy moth on endangered, threatened or sensitive reptiles, amphibians and snails listed in tables III-3 and III-4 result from temporary changes in habitat and site conditions or possible reductions in food supplies.

Habitat quality for Cheat Mountain salamander, Shenandoah salamander (changes in moisture regines and ground temperature) and the Madison Cave isopod (changes in water quality) may be adversely affected by defoliation caused by gypsy moth.

Endangered or threatened plants may be directly affected by being eaten by the gypsy moth. Defoliation interrupts normal patterns of translocation of water, minerals and production of food. However, gypsy moth is not known to feed on swamp pink, running buffalo clover, shale barren rockcress or harperella. Habitat quality for these plants may be adversely affected from defoliation of surrounding vegetation.

Populations of clams, crustaceans and fish listed in tables III-3 and III-4 respond to changes in water quality. Information is limited for estimating the effects of increased nutrient loading and oxygen depletion (Sharpe, 1982) caused by gypsy moth outbreak defoliations. The level of increase in nutrients may actually improve water quality for aquatic plants and animals.

Effects of gypsy moth defoliations on insects listed as sensitive (table III-4) are unknown.

There are no known effects of gypsy moth on snowshoe hare or New England cottontail rabbit.

Effects of gypsy moth on alder flycatcher and loggerhead shrike are thought to be insignificant. Bewick's wren may indirectly benefit from increased food supplies of bark beetles and other insects found in areas with tree mortality.

The southeastern shrew and other shrews listed in table III-4 are likely to benefit by the additional food supply of gypsy moths.

Fish and Aquatic Ecosystems

Water quality dictates the health and well being of aquatic ecosystems which include fish. Gypsy moth defoliations may directly affect water quality in three ways:

1. Increase water yield and augment stream flow;

2. Increase sunlight intensity and duration on exposed water surfaces;

3. Increase nutrient deposition in the form of partially-eaten vegetation and insect frass.

The magnitude of impacts of gypsy moth varies from watershed to watershed, depending upon the intensity and extent of defoliation and the forest composition of the area. When reviewing the following description of effects, keep in mind there are no known aquatic plants or organisms at risk from the gypsy moth.

Increases in water yield during the growing season as a result of insect defoliation can be expected (Corbett and Heilman 1975; Love 1955; Potts 1984). Increased water yields affected low flows but had no detectable effects on peak flows (Potts 1984; Helvey and Tiedemann 1978). Sharpe (1982) states that gypsy moth defoliation increased water recharge of aquifers in Central Pennsylvania. Temporary increases in

water supply during the growing season are likely to be beneficial to aquatic ecosystems (Corbett and Lynch 1987; Sharpe 1982).

Increased sunlight intensities and duration on water surfaces increase water temperature, which may adversely influence water chemistry and life functions of aquatic organisms. Increases in mean maximum temperature for streams on Newark, New Jersey watersheds where streamside vegetation had been killed with herbicides were reported by Corbett and Heilman in 1975. This study, however, does not completely simulate gypsy moth defoliation effects on water quality because:

1. Refoliation of gypsy moth defoliated areas usually occurs before summer stream temperatures become critical in July-August, and herbicides used on Newark watersheds reduced canopy foliage cover from 3 to 31 percent of watershed areas throughout the growing season:

2. Mountain streamside vegetation contains a significant component of rhododendron and yellow poplar (Sharpe 1982), which are species avoided by gypsy moth but susceptible to herbicides.

In addition, Sharpe (1982) suggests that stream temperature influenced by gypsy moth defoliation in riparian zones of streams is of little significance.

Grace (1986) concluded that although more nutrients are recycled following gypsy moth defoliation, most nutrients are in the upper layers of the forest floor at the end of the summer. Sharpe (1982) suggests that increases in stream nutrient concentrations as a result of gypsy moth defoliation are unlikely to be greater than increases from clear-cutting. Corbett and Lynch (1987) reported that clear-cutting 45 percent of a watershed had little effect on nutrient concentrations. If insect larvae, frass and partially eaten leaves accumulate in extremely small water bodies or streams with low water exchange rates, temporary effects would be similar to other organic pollution, i.e., taste, odor, color and bacterial-related problems (Sharpe 1982).

Over the long term, changes in plant communities along streams as a result of gypsy moth infestations are not known to have any appreciable effects on aquatic ecosystems.

Soil

Defoliation by the gypsy moth can speed the transfer of nutrients from vegetation to the soil surface. Grace (1986) studied litter fall on defoliated and foliated plots in a Pennsylvania oak forest. Litter was collected throughout the year, separated by plant and insect components, and analyzed for dry weight and five major nutrients. The plots were covered by even-aged, second-growth stands of oak typical of central Pennsylvania. Red oak and black oak were the most numerous overstory species on the plots, while red maple, white oak, chestnut oak, and scarlet oak were also abundant. Yellow-poplar and black gum were found infrequently. The closed overstory canopy allowed for a sparse understory except for mountain laurel, which was dense in some areas.

Total biomass estimates of litter falling on the defoliated and foliated plots were not significantly different but the timing and composition of litter fall were. Within the foliated plots, 90 percent of the litter was deposited during the autumn and tree leaves were the major litter component. Major litter components within the defoliated plots included insect frass, leaf fragments, and tree leaves, with 56 percent of the litter being deposited during the growing season.

Gypsy moth defoliation caused a statistically significant increase in the quantities of nitrogen, phosphorus, and potassium and a significant decrease in the quantity of calcium in the litter fall. Nitrogen returned on the defoliated areas was 68 percent greater than on foliated plots; potassium was 82 percent greater; phosphorus was 21 percent greater, and magnesium showed trends of a slight increase. Conversely, the return of calcium was 27 percent lower on the defoliated areas. These differences were attributed to the gypsy moth altering the composition and seasonal distribution of the litter fall (Grace 1986).

There is little evidence that these nutrients are lost from the site. In fact, it may benefit regeneration that is already established on the site, when the overstory trees die (Corbett and Lynch 1987). The increase in available nutrients is of a temporary nature and ends when the gypsy moth population collapses.

Water Quality

There is a definite increase in water yield when watersheds are heavily defoliated. The reduction in interception and transpiration losses due to the "thinned" forest canopy leads to increased soil moisture; thus a larger percentage of precipitation is converted to streamflow. These temporary increases in water supply during the growing season are likely to be beneficial (Corbett and Lynch 1987).

Studies of water yield and quality were conducted on the Newark, New Jersey Pequannock Watershed in 1971. The study coincided with a severe gypsy moth outbreak in New Jersey. Two small watersheds in the oak-hickory forest type were studied. Watershed 2 (42 acres) was completely forested at the time of the gypsy moth defoliation, while watershed 3 (23 acres) had a small percentage of its area in overstory vegetation because the vegetation had been deadened 5 years earlier. At least 75 percent of the overstory was defoliated on watershed 2 and only minor defoliation on watershed 3. The gypsy moth defoliation had a significant influence on water yield. On both these watersheds, annual water yield increased by 5.82 inches when estimated by the control watershed technique, while the single-watershed calibration method estimated the increase at 4.89 inches. Eighty percent of the yield increase occurred during the growing season. Using the average of the two estimates, 5.36 inches, water production was increased by 146,000 gal/acre due to defoliation (Corbett and Lynch, 1987).

During heavy periods of rain, it is possible that significant accumulations of insect larvae, frass and leaf parts may be washed into small streams located in heavily defoliated areas. However, these effects would be of short duration (Corbett and Lynch 1987). Such material, when found in small streams, lakes or ponds, affects the taste, odor and color of the water.

Increased levels of bacteria in small streams, ponds and lakes may also occur in heavily defoliated areas. Corbett and Lynch (1987) reported on a study in 1984-85, where water samples were collected from three pristine forest streams (Bear Gap Run, Wildcat Run, and Sweet Root) located on the Buchanan State Forest, Bedford County, Pennsylvania. Water samples were collected weekly at 4 points along Bear Gap Run, 5 points on Sweet Root and 2 points along Wildcat Run. Sampling began in April 1984 and continued through August 1985. Each of the watersheds was heavily defoliated (85 to 95 percent) in May-June 1984. This was followed by defoliation again in 1985, but it was less severe than the previous year. Heavy tree mortality occurred on the three watersheds as a direct result of the gypsy moth defoliation.

Analysis of the water samples for the occurrence of bacteria revealed a large increase in total fecal coliform and fecal streptococcal densities in the three

streams during the period of heavy (May-June) defoliation. Fecal coliform densities ranged from a low of near zero to a high 90/100 ml, and fecal streptococci ranged from 0 to a high of 25,000/100 ml. The fecal coliform/fecal streptococcal ratios indicate that these indicator organisms were from nonhuman sources (Corbett and Lynch 1987) and likely pose no threat to human health.

Little information is available concerning the effect of gypsy moth defoliation and associated mortality on stream temperature. Swift and Messer (1971) reported increases in summer maximum temperatures of $5^{o}F$ following the deadening of riparian overstory and the cutting of understory vegetation at the Coweeta Hydrologic Laboratory. Cutting of the dead overstory trees caused maximum stream temperatures to rise only $1^{o}F$, indicating that topographic shading or ground water inflow may have helped minimize temperature increases.

Corbett and Heilman (1975) reported a $4^{o}F$ increase in the mean maximum temperature for a stream on the Newark, New Jersey municipal watersheds where riparian vegetation has been deadened. This suggests that water temperature increases could occur as a result of gypsy moth defoliation. However, since most of the trees along streams or in riparian areas are not preferred by the gypsy moth, significant increases in water temperature are not anticipated.

It is reasonable to expect that heavy gypsy moth defoliation in June-July would cause small increases in the temperatures of small streams. However, the effect of such temperature increases on aquatic insect populations or native or stocked trout is probably insignificant.

Air Quality

No effect on air quality is anticipated under this alternative.

Visual Resource

The Appalachian Mountains, Blue Ridge Mountains and Shenandoah Valley are renowned for their scenic beauty. Implementation of alternative 1 would in some locations allow the gypsy moth to create direct impact on the visual resource of these areas. As populations build and defoliation intensifies, the resulting impacts will become visible from the many scenic vistas and parkways. Some individuals may regard the defoliation as unsightly; to others it may represent a curiosity. This condition will be of short duration, lasting until the trees refoliate in mid-July. Many of the refoliated trees will exhibit thin crowns and smaller, off-colored (chlorotic) leaves. In the fall, the second crop of foliage seldom produces the bright fall colors as seen in foliated areas. However, long-term effects to the visual resource may be enhanced due to an increase in species that exhibit more fall foliage color.

Areas of heavy gypsy moth-caused mortality will be visible to individuals the following spring, summer and early fall from scenic vistas and overlooks. Duration of impacts on the visual resources will depend on the location, size of area and amount of tree mortality.

Recreation

In most cases the high value parks and recreation areas would receive some type of treatment to prevent excessive defoliation and insect nuisance under State/Federal cooperative suppression projects. However, depending on the intervention tactic used and precautions implemented, some decline in usage could be expected. This decline

in use would result from closure of developed recreation areas during treatment operations and objections of some users in using treated areas.

In other high value parks, recreation areas and commercial campgrounds that are not treated due to lack of funds or other restrictions, visitor use may decline. The amount of reduced use will depend upon gypsy moth population levels, intensity of defoliation and related insect nuisance. In addition, those areas that experience heavy defoliation may have increased tree mortality and associated removal and replacement costs. If no suppression actions are taken, increase in gypsy moth populations increase the probability of artificial transport of gypsy moth life stages.

Effects of gypsy moth defoliation on dispersed recreation under this alternative would be difficult to estimate. In some situations it would displace the use from infested to uninfested areas of the AIPM Project. Although the total amount of dispersed use would not decrease significantly throughout the area, the quality of the experience would be greatly reduced for people involved in viewing scenery for pleasure. Other dispersed activities may not be directly affected to any measurable degree by outbreak populations of the insect. People involved in trout fishing on a favorite remote stream will likely do so despite the amount of defoliation on adjacent hardwoods so long as the fishing success meets expectations. Hikers on trails that pass through defoliated areas are not expected to avoid traversing such areas. In many cases, dispersed recreation users will view defoliation under this "no action" alternative synonymous with "no management".

While moderate to heavy defoliation can be expected to directly affect some dispersed recreation activities due to nuisance and aesthetic degradation during the late spring and early summer, these impacts will be of short duration. However, if heavy tree mortality occurs, this can directly and indirectly affect the recreational setting by first denying users the green, shaded forest environment expected and later by increasing the risk to recreationists from hazard trees.

Cultural and Historical Resources

No effects on cultural and historical resources are anticipated under this alternative from the AIPM Program.

Public Health

There would be no impacts to public health from AIPM Program intervention tactics under this alternative.

Within the untreated areas, some individuals may experience minor allergic reactions to the fine gypsy moth larvae hairs (Tuthill et al 1984).

Socio-economic Effects

Under this alternative, there may be a direct effect on local timber markets in portions of the AIPM Project Area. Untreated private or industrial landowners may opt to harvest their timber to reduce potential losses to gypsy moth. This could cause localized flooding of timber markets adversely affecting stumpage prices. Local landowners would probably be unable to sell all of the volume of dead hardwood timber. In many cases, this impact would represent a significant loss to individual landowners in terms of expected return on investment. This process may be repeated as the insect spreads southward through the AIPM Project Area into and through local

market areas. In many of the remote or inaccessible areas, the dead timber will not be salvaged.

In areas behind the advancing gypsy moth front of infestation, defoliating populations will begin to collapse. Tree mortality and associated salvage sales will decline, thus stabilizing timber markets.

In areas where mortality is extensive, some private landowners may decide to convert the land to other uses where possible. Other private forests may receive minimum attention and investment. In an extreme case, prominence of forest-related industries and local economies may be moderately affected.

Prime Farmland and Rangeland

There would be no effect to prime farmland and rangeland under this alternative because these areas are normally unforested.

Wetlands and Flood Plains

There would be no effect to wetlands and flood plains from uncontrolled gypsy moth infestations.

Consumers, Civil Rights, Minority Groups and Women

None of these groups are likely to be significantly affected by implementation of this alternative.

Wilderness

Estimated effects of gypsy moth control are based on their impact on wilderness attributes and values. The gypsy moth is considered an exotic species. It is not one of the natural ecological forces that operate in the Appalachian Mountain forests. In wilderness, therefore, they are not a component of the natural process and impact the wilderness character. Likewise, gypsy moth intervention tactics also impact wilderness attributes and values. The primary attributes of wilderness are natural integrity, apparent naturalness, opportunities for primitive recreation, and opportunities for solitude. The supplemental attributes include outstanding ecological, geological, cultural and historical features. Scenic values include vegetation patterns, and natural formations of land, rock and water.

Natural Integrity

Under alternative 1, natural integrity would be affected by the gypsy moth. Susceptible wilderness would reflect a condition primarily shaped by the forces of nature, although in this case, through an exotic insect introduced by man. This alternative would not allow human interference on the wilderness resource for gypsy moth control under the AIPM Program.

In general, the physical and biological impacts created by the gypsy moth in wilderness under this alternative will be similar to those described under the general project area.

The effects of this alternative would allow natural processes to operate in the presence of gypsy moth. This alternative would allow processes to occur that would change the forest composition of the wilderness in a manner not normally expected.

Wilderness would be maintained so that ecosystems are not affected by human manipulation, but influenced by gypsy moth.

Apparent Naturalness

This attribute is closely related to natural integrity and is influenced by the same impacts as well as by the evidence of human activities in the wilderness. Alternative 1 would not detract from the goal of allowing existing human evidence to slowly fade away.

This attribute would be adversely affected by allowing the gypsy moth, an exotic pest, to go unchecked in wilderness. Gypsy moth caused defoliation, tree mortality and related impacts to the wilderness ecosystem would be readily apparent to the public. There could be direct effects on vegetation, wildlife, soil and water quality under this alternative. Biological diversity could be affected as the gypsy moth altered the natural habitat, competed with other organisms for food and/or provided an unnatural supply of food. These effects would be cumulative if infestations defoliated vegetation and caused mortality in following years.

Opportunities for Primitive Recreation

Alternative 1 would allow for defoliation and mortality of existing trees and subsequently the establishment of new plant growth. This impact may either contribute or detract from the recreation experience. The direct effects of dead trees and new plant growth would allow for a high degree of challenge and risk. Some wilderness visitors would not use areas where high populations of gypsy moth exist, thus reducing certain benefits for them. Other visitors may choose these areas for the physical and mental challenges as well as the primitive conditions created by the gypsy moth.

The indirect and cumulative effects of allowing gypsy moth in wilderness would provide a change in vegetation and balance of wildlife over time. This would change the existing physical and mental challenges and the variety of primitive recreation opportunities.

Opportunities for Solitude

The direct effect of alternative 1 would be to reduce the vegetative screening or eliminate some stands of trees for a period of time. Many of the defoliated hardwoods will refoliate to again provide screening and opportunities for solitude. If extensive mortality occurs, regeneration should occur in approximately 5 years and restore vegetative screening. Opportunities for solitude may increase because the dense undergrowth would offer more solitude to those visitors willing to penetrate it and visitors would feel that they were isolated from civilization.

The indirect and cumulative effects of this alternative would allow a mix of new species to succeed susceptible hardwoods in the stand composition and maintain the opportunities for solitude over time. As evidence of past human activities disappeared, the visitor would continue to feel removed from civilization.

Supplemental Attributes

The geological, cultural and historical features would not be directly, indirectly or cumulatively affected by gypsy moth. The direct effects of alternative 1 may be to reduce the number and size of old growth trees. At high population levels, the gypsy moth could also impact other ecological features in wilderness, such as unique floral

communities, unique aquatic ecosystems, or threatened or endangered species of plants or animals. The magnitude and intensity of impacts would depend on the extent and intensity of gypsy moth populations and the susceptibility of the forest stands to gypsy moth defoliation and mortality. The cumulative effects should serve to maintain a balance of old growth trees with younger trees, providing other natural processes occur.

The scientific value of wilderness as a base line area where natural processes are allowed to operate without human interference will not be impacted. The wilderness, if left untreated, would show how nature copes with gypsy moth in a long-term sense.

Scenic Values

Alternative 1 would directly affect scenic values. If large numbers of defoliated trees occur, scenic values will be impacted until the trees refoliate later in the season. Mortality associated with defoliation would produce longer-lasting impacts as dead, standing trees fall and decompose. Scenic values would improve with time as the area became revegetated.

The indirect and cumulative effects of this alternative would be minimal as the scenic values of the landscape qualities of form, line, color, texture and variety would be maintained over time. Different species' composition and density will produce a pattern of vegetation comparable to the preinfestation landscape. This effect could pertain to all wildernesses and in the long term maintain scenic values.

Action Alternatives

The following discussion of action alternatives that may be considered for implementation in the AIPM Project Area involves a range of IPM tactics, including no treatment. Prior to the implementation of any selected alternative and related intervention tactics, a site-specific environmental analysis will be completed on each area considered for treatment and documented as appropriate. The analysis will determine the need for treatment and the range of possible intervention tactics that may be used. AIPM personnel will coordinate with appropriate landowner(s) or manager(s) to develop an effective intervention strategy consistent with management objectives and related biological considerations of the area. Mitigation measures and their effectiveness will be identified to minimize as many of the adverse environmental impacts as possible.

Within the General Project Area, some landowners may object to the use of any intervention tactic contained in these alternatives. Should this occur, gypsy moth populations may eventually build to defoliating levels in untreated areas. Efforts would be made to protect adjacent resources by use of appropriate intervention methods in this alternative on surrounding forest lands to reduce the spread, population build-up and associated impacts outside the untreated areas.

ALTERNATIVE 2

In the General Project Area, gypsy moth specific intervention tactics and biological tactics would be used against the gypsy moth. Gypsy moth specific tactics consist of mass trapping, disparlure (tape or flakes), release of sterile life stages, NPV, and parasites that only affect the gypsy moth. Biological tactics include Bacillus thuringiensis (Bt) and all parasites and predators. These tactics are normally used in areas having very light (less than 100 egg masses/acre) gypsy moth populations. At higher population levels, (greater than 100 egg masses/acre), NPV or Bt could be used to reduce larval populations to prevent defoliation and mortality.

These tactics may be employed individually or in combination, depending upon gypsy moth population levels and management objectives. For example, application of NPV or Bt in April or May could be used to reduce larval populations followed by later applications of disparlure in late June or July to disrupt male moth mating, or mass trapping of male moths. Parasites, depending upon the gypsy moth stage targeted, could also be combined with earlier application of either Gypchek or Bt.

The use of the inherited sterility tactic, however, would probably not be combined with any other intervention tactic since success requires maximum survival and growth of the introduced sterile insects to mate with as many native gypsy moths as possible.

Vegetation

Implementation of alternative 2 would, depending upon the intervention tactic(s) used, have little direct effect upon the vegetative components in the treatment area. Since most of the gypsy moth specific tactics are employed against light populations, only minor defoliation would likely occur except for the inherited sterility tactic described in the following paragraph. At higher population levels (greater than 100 egg masses per acre) where NPV, Bt, or combinations would be used, significantly less defoliation would be expected to occur than in similar areas under the "No Action" alternative. The effects on vegetation by employing this alternative would be to reduce larval populations, defoliation, and subsequent tree mortality the following year within the treatment area.

The use of the inherited sterility tactic (release of partially sterilized eggs) may increase the amount of defoliation over alternative 1 the first year because of an associated increase in feeding larvae. The amount of defoliation resulting from this tactic would depend upon the gypsy moth population in the treatment area, the amount of susceptible vegetation, the amount of eggs introduced into an area and survival of the introduced insects. Since this tactic is normally effective in areas having extremely light populations, only a slight increase in defoliation would be expected to occur. The effects of this tactic would result in much lower gypsy moth populations in the area the following year.

Wildlife and Wildlife Habitat

In areas where this alternative is implemented, impacts on wildlife or wildlife habitat would be proportional to the degree of gypsy moth control achieved.

Application of gypsy moth-specific tactics (disparlure, release of sterile life stages, mass trapping, nucleopolyhedrosis virus) are not known to have any direct effects on wildlife or wildlife habitat (Lautenschlager et al , 1978; 1979). Release of sterile gypsy moths increase existing gypsy moth populations and may increase food supplies for some insect predators. However, introduction of gypsy moth larvae may increase defoliation rates and increase the potential for reductions in mast crops.

Application of gypsy moth non-specific tactics (parasite and predator release, Bt) are not known to have any direct effects on wildlife or wildlife habitat (USDA FEIS, 1985a). Release of predators is additive to existing insect populations and may temporarily increase food supplies for some insect eaters. Release of parasites, predators or Bt may reduce populations of leaf-chewing insects (Brown et al 1984) which contribute to food supplies for some insect-eating animals (i.e. shrews, warblers, vireos).

Birds that often prey upon native defoliating Lepidoptera may be indirectly impacted by the application of Bt. These insects are often a major food source for both mature and immature birds. The extent of the indirect impact will depend upon the availability of alternate food sources.

Larvae feeding on understory shrubs or other vegetation may only be slightly affected by Bt applications, since most material applied aerially is intercepted by the forest canopy. As a result, canopy-foraging species may alter their feeding habits to locate adequate sources of food on understory vegetation.

Effectiveness of Bt declines rapidly after application, normally lasting from 7-14 days. Lepidoptera larvae emerging after this period would not be affected and would become a food source to insect-eating wildlife (USDA FEIS, 1985a). Following aerial spraying of 30- and 35-acre blocks with Bt in Illinois, bird species occurrence or diversity remained relatively the same (McGowan, 1985 unpub. report).

No additional indirect or cumulative impacts on wildlife or habitats are anticipated unless the same area requires treatment with Bt repeatedly in subsequent years. In such cases, the effects described above would be prolonged for populations of Bt-susceptible Lepidoptera in treated areas. It is unlikely however, that any Lepidoptera species will be eliminated from the Project Area from applications of Bt.

Insects

Application of gypsy moth-specific tactics are not known to have any direct effects on insects other than the gypsy moth. Insect predators may benefit from increased populations (inherited sterility tactic) of gypsy moth or may vary prey selection only slightly (NPV) in response to the presence of gypsy moth.

Insect predators would experience increased competition for food when predators and parasites are released. Nontarget populations of Lepidoptera larvae would experience increased pressure from predation.

Bt applications will affect native Lepidoptera that are feeding on foliage treated with Bt. Some forest Lepidoptera species that may be found in treatment areas at time of application which are susceptible to Bt are listed in table IV-1 (Abbott Laboratories 1986 Specimen Label).

The use of Bt, however, only impacts those native Lepidoptera that are actively feeding in the treatment area during or shortly after the time of application. The significance of this impact on native populations would depend upon the size of the treatment area, the number of Bt applications used and Lepidoptera present with a similar life cycle to gypsy moth. Multiple treatments create the potential for two types of cumulative effects to occur:

1. Repeated treatments of the same area during the same growing season are likely to prolong effects associated with single treatments.

2. If Lepidoptera populations have not recovered, treatments in subsequent years of the same area or adjacent areas may reduce or perpetuate low populations of Bt susceptible Lepidoptera.

Table IV-1.--Some Lepidoptera species susceptible to infection with *Bacillus thuringiensis* HD-1 or NRD-12 strain

Scientific Name	Common Name
Alsophila pometaria	Fall cankerworm
Argyrotaenia juglandana	Hickory leaf roller
Argyrotaenia velutinana	Red-banded leaf roller
Choristoneura fumiferana	Spruce budworm
Choristoneura rosaceana	Oblique banded leaf roller
Ennomos subsignarius	Elm spanworm
Erannis tiliaria	Linden looper
Hemerocampa definita	Definite marked tussock moth
Hemerocampa leucostigma	White marked tussock moth
Hemerocampa (=Olene) *plagiata* (Walker)	Dark tussock moth
Hyphantria cunea	Fall webworm
Lymantria dispar	Gypsy moth
Malacosoma disstria	Forest tent caterpillar
Nephopteryx (= Salebria) *subcaesiella*	Locust leaf roller
Paleacrita vernata	Spring cankerworm
Pantographa limata	Basswood leaf roller
Sibine stimulea	Saddleback caterpillar
Thyridopteryx ephemeraeformis	Bagworm

Lepidoptera larvae that feed on the underside of leaves will not be affected by application of *Bt*. Effects on Lepidoptera larvae that feed on understory plants will be less than effects on canopy-feeding larvae because most of the spray is deposited on the upper forest canopy.

Single or multiple applications of *Bt* may indirectly impact insect predators of *Bt*-susceptible Lepidoptera by temporarily reducing food supplies.

A recent survey conducted in Illinois recorded higher total Lepidoptera populations in *Bt*-treated areas than in control areas. Populations of seven out of eight species monitored were significantly higher during most of the post treatment period. Total abundance was also greater in *Bt*-treated areas, however, not all *Bt*-susceptible species were evaluated individually in this survey.

Those Lepidoptera that feed on understory shrubs and plants are generally only slightly impacted by the aerial application of *Bt* since most of this insecticide is deposited on the upper forest canopy.

Single or multiple applications of *Bt* may indirectly impact predators of *Bt*-susceptible Lepidoptera by temporarily reducing food supplies. Surveys of *Bt*-treated areas in Illinois show no adverse impacts on native moths. In fact, more individual moths were recorded in sprayed areas than unsprayed areas two months after treatment (McGowan 1985, unpub. report).

Endangered, Threatened and Sensitive Species

The bald eagle, American peregrine falcon, Virginia northern flying squirrel, Cheat Mountain salamander, Shenandoah salamander, Roanoke logperch, all endangered and

threatened clams, snails, crustaceans or plants are not known to be directly affected by applications of biological or gypsy moth specific tactics. Indiana bat, Virginia big-eared bat, Small-footed bat, Keen's myotis and Rafenesque's big-eared bat may be indirectly affected by temporary reductions of Lepidopterous insects as a food source in treated areas. The degree to which these species are affected depends upon the ratio of treated to untreated bat foraging habitat and the availability of other insects for food. None of these species relies exclusively on Bt-susceptible Lepidopterous species affected by treatments proposed in this alternative. Effects of gypsy moth population outbreaks on habitat for Virginia northern flying squirrel, Virginia big-eared bat, Indiana bat, bald eagle, Cheat Mountain salamander, Shenandoah salamander, Madison Cave isopod and endangered, threatened and sensitive plants would be reduced to the degree applied intervention techniques are successful. Lepidoptera species such as the marbled underwing moth, precious underwing moth, Hebard's nocutid moth, tawny cresent butterfly, regal fritillary butterfly, and chestnut clearwing moth (table III-4) may be susceptible to applications of Bt.

Fish and Aquatic Ecosystems

Implementing alternative 2 would reduce the effects of gypsy moth defoliations on fish and aquatic ecosystems to the degree gypsy moth populations are controlled. There are no known direct effects of gypsy moth-specific on biological intervention tactics on fish or aquatic organisms.

Successful applications of Bt or NPV may temporarily increase food supplies for fish and other opportunistic water feeders if some larvae fall into streams when they succumb to treatment. Acute Bt toxicity tests conducted on rainbow trout, bluegills and coho salmon identified no impacts on these species (USDA FEIS 1985a). No aquatic insects are known to be affected by applications of Bt or NPV in watersheds.

Soil

None of the intervention tactics in this alternative are likely to have any direct, indirect, or cumulative impacts on the soil or litter in selected treatment areas. If the tactics implemented prevent gypsy moth populations from building to defoliating levels, the rapid transfer of nutrients from vegetation to the soil surface as discussed under the "No Action" alternative will not occur.

Gypsy moth NPV has no known effect on the environment in which it is applied. The virus has a shorter residual persistence in soil than the naturally occurring NPV (USDA FEIS 1985a). Studies on the fate of Bt indicate that the spores will persist in the soil for several weeks, depending on soil type, soil flora, soil pH and solar radiation (USDA FEIS 1985a).

Water Quality

None of the intervention tactics proposed for use in this alternative are expected to affect water resources found within selected treatment areas. Streams flowing out of watersheds or forest stands that may be treated with NPV or Bt are not expected to experience any water quality degradation.

If the intervention tactics successfully prevent population buildup and excessive defoliation by the gypsy moth, effects on soil moisture and water yield, temperature and quality as described under the "No Action" alternative will be prevented or reduced.

Air Quality

No effects on air quality are anticipated under this alternative.

Visual Resource

If the intervention tactics prevent or reduce defoliation in scenic areas, this alternative would be expected to maintain visual and scenic values within the general project areas. Some light defoliation could occur in treatment areas; however, the effects on the visual resource would be minimal.

Recreation

Some high value parks, recreation areas, and commercial campgrounds may require treatment. If a microbial insecticide is used, some decline in use may result if campgrounds are closed during treatment. Users will react differently, with some preferring treatment areas while others avoid them. This will have an effect on use.

The effect of implementing this alternative on dispersed recreation should be minimal. Individuals involved in hiking, fishing, hunting, viewing scenery for pleasure, and other dispersed activities should experience only minor impacts, if any.

Cultural and Historical Resources

No effects on the cultural or historical resources are anticipated under this alternative.

Public Health

This alternative incorporates intervention with two microbial insecticides, *Bacillus thuringiensis*, (*Bt*), and the gypsy moth host specific nucleopolyhedrosis virus (NPV).

Bt is generally considered to cause no threat to human health. In over 18 years of *Bt* use, there have been no scientifically documented cases or evidence of *Bt*-caused illness directly attributable to forestry-use situations.

Three incidents of human infection from *Bt* have been reported. In one case, a laboratory technician accidentally stuck a *Bt*-contaminated needle into his finger, which caused a skin infection (USDA FEIS 1985a). The variety of *Bt* that caused this infection is not the variety that is used in gypsy moth suppression. The second reported case involved *Bt* that was splashed into the eye of a farmworker, resulting in an eye ulcer (USDA FEIS 1985a). The third incident was reported in the Fall of 1987 and involved three members of a Kansas City, Missouri family who became ill after eating honey received from a Maine retail establishment. Their illness was characterized by vomiting and diarrhea which resolved itself after 18 hours. Analysis of the honey at the University of Missouri in Kansas City tentatively identified the causal agent as *Bacillus cereus*, a common diarrhea-causing organism. The Centers for Disease Control in Atlanta, Georgia examined the isolate for confirmation and identified it as *B. thuringiensis* rather than *B. cereus*. The CDC feels, from an epidemiological standpoint, there is insufficient evidence to implicate *Bt* as the cause for this food poisoning, nor is there any need to curtail the use of *Bt* in gypsy moth suppression programs (Hoover, 1987).

The Ministry of Natural Resources in Ontario, Canada temporarily suspended *Bt* spraying during 1987 when it was discovered that its stock of *Bt* insecticide was

contaminated with unexpectedly high levels of Streptococcus faecium and S. faecalis. Spraying was resumed after Health and Welfare Canada determined that the contamination posed no concerns in terms of adverse health effects (Churcher 1987).

Both the USDA Forest Service and the US Environmental Protection Agency have reviewed the concerns about Bt and believe they are unfounded (see letter concerning Biological Pesticide Bioburden, appendix D).

The use of the nucleopolyhedrosis virus (NPV) in this alternative is not expected to pose any human health concerns. NPV has shown no adverse effects on fish, game birds, vertebrates or man. The possibility that the gypsy moth NPV may be related to the arthropod borne (Arbo) viruses and other viruses which infect man has been investigated. In studies carried out in 1974-1975 at Yale University, all of the known arboviruses were found to bear no relation to the NPV of the gypsy moth. Other viruses, such as Herpes, were also found to be unrelated to the gypsy moth NPV (Mazzone et al , 1976). Since Gypchek is produced from gypsy moth larvae that have been inoculated and killed by NPV, the powder formulation will contain a small number of insect parts and other microorganisms. The occurrence of and possible significance of the microorganisms associated with the production of NPV was investigated. Results of the study failed to detect any obligate anaerobic or fecal coliform bacteria and no primary mammalian pathogenic bacteria or fungi in the NPV material samples. However, the presence of some opportunistic pathogens was detected, indicating the need for rigorous quality control of production batches (Podgwaite et al 1983).

Socio-economic Effects

This alternative, if implemented, should reduce or minimize the anticipated drop in timber prices in local and regional timber markets that could occur under alternative 1. Reducing gypsy moth populations will minimize defoliation and associated timber mortality. Local timber prices should not be affected by gypsy moth.

Prime Farmland and Rangeland

It is possible that some drift of NPV or Bt applications over forested areas may occur on adjacent farm or rangeland. However, neither biological insecticide poses any known risk to range animals, and no feed crop tolerances have been set by EPA.

Wetlands and Flood Plains

AIPM intervention tactics will not physically impact or alter wetlands and flood plains.

Consumers, Civil Rights, Minority Groups, and Women

None of these groups are likely to be affected by implementation of this alternative.

Wilderness

Under this alternative, no intervention tactics would be applied to the wilderness resource, and the impacts would be similar to those described under alternative 1. Population monitoring would continue in all wildernesses to determine population trends and levels.

ALTERNATIVE 3

This alternative includes the gypsy moth specific and biological intervention tactics discussed in alternative 2, plus the addition of the insect growth regulator, diflubenzuron or various combinations of these tactics in the General Project Area.

Vegetation

Implementation of this alternative would have similar effects on vegetation as those described in alternative 2. It is anticipated that diflubenzuron would be applied to forested areas in the AIPM Project that have rapidly building or very heavy gypsy moth populations that would result in moderate to heavy defoliation. The use of this insecticide would greatly reduce gypsy moth populations and defoliation, such that other less impacting tactics, such as disparlure flakes, could be used the following year to maintain populations at low levels. Use of diflubenzuron may also protect the flowers as well as the foliage of many hardwoods and maintain seed production at near normal levels.

Wildlife and Wildlife Habitat

Alternative 3, if implemented, would have similar effects on wildlife and wildlife habitat as those described for alternative 2. Because diflubenzuron is the treatment most effective in reducing gypsy moth populations capable of complete defoliation, the likelihood of occurrence of effects of gypsy moth described in alternative 1 would be minimized when diflubenzuron is used. The likelihood of indirect effects from suppression of some insect populations would increase when diflubenzuron is used. Wildlife that key on areas with concentrated populations of gypsy moth (house wren, rufous-sided towhee, yellow-billed cuckoo, starling, white-footed mice, short-tailed shrew) would not be attracted to diflubenzuron-treated areas. Wildlife that routinely feed on canopy arthropods would be exposed to extreme fluctuations of some prey species (Martinat et al, 1988). There are no species of wildlife, however, that are known to feed exclusively on diflubenzuron-susceptible arthropods. Canopy foraging species may alter feeding habits to locate adequate sources of food.

Diflubenzuron is not known to adversely affect mammals or birds. (USDA FEIS 1985A, Willcox and Coffey 1978).

The following paragraph is taken from the Final Environmental Impact Statement, as supplemented, for Gypsy Moth Suppression and Eradication Projects:

> "The acute toxicity of diflubenzuron to mammals has been investigated by Philips-Duphar B.V., Harris Laboratories, and the Huntingdon Research Center (Willcox and Coffey 1978). Because of its mode of action, the interruption of chitin synthesis on the insect, diflubenzuron has low mammalian toxicity. The very low toxicity of diflubenzuron for mammalian and nonmammalian species, exclusive of insects and certain chitin-containing arthropods is in part related to the ability of the compound to be absorbed by the animal exposed and its ability to biochemically detoxify and eliminate diflubenzuron from its system (Willcox and Coffey 1978)."

Diflubenzuron was found to have "no significant effect" on breeding success or growth of nestlings (De Reede, 1981).

Additional information on the impact of diflubenzuron applied at rates from .5 oz to 1 oz. active ingredient per acre in several different forest ecosystems is presented in the USDA FEIS 1985b.

Insects

No significant treatment effects from the use of diflubenzuron were found for Condylognatha (bugs and aphids), predaceous arthropods (ambush bugs, stink bugs, assassin bugs, jumping spiders, two-clawed hunting spiders, hakel banded weaver spiders), taxonomic richness of Candylognatha or taxonomic richness of predaceous arthropods.

Gypsy moth, Geometroidea (geometrid moths), Sphingidae (sphinx moths), Noctuoidea (cutworm moths), Tenthredinoidea (sawflies), and Gryllidae (crickets) populations and mandibulate herbivorous taxonomic richness were consistently lower on treated plots no significant decline was observed for herbivorous taxonomic richness in oak stands, microlepidoptera in oak stands and mandibulate herbivorous arthropods (excluding Lepidoptera) in red maple stands. Microlepidoptera appeared to be least affected by application of Dimilin (Martinat et al 1988), possibly because of feeding habits.

Nearly all immature mandibulate insects have demonstrated some sensitivity to diflubenzuron, including Orthoptera (grasshoppers, crickets, walkingsticks) and Tenthredinoidea (Willcox and Coffey 1978; Maas 1980; Blumberg 1986). Mesostigmata Orbatei and Prostigmata acarines (mites) were adversely affected and did not recover to pretreatment levels (Blumberg 1986) at a rate of 2 oz. of active ingredient per acre (2-4 times AIPM application rates).

No obvious short term trends in populations of other organisms captured by Blumberg (1986) could be attributed to application of diflubenzuron. Immature Apanteles melanoscelus (Ratzeburg) (a braconid) and Tachinids (flies) developing within treated caterpillars are susceptible to applications of diflubenzuron (Madrid and Stewart 1981). Adult parasites are not seriously affected regardless of the method of exposure to rates of diflubenzuron.

Endangered, Threatened and Sensitive Species

Effects of implementing alternative 3 on endangered and threatened species would be similar to effects of alternative 2 except for diflubenzuron. Organisms that produce chitin will potentially be affected during periods when diflubenzuron is available for uptake (Willcox and Coffey 1978). Species such as the regal fritillary (table III-4) may be susceptible to applications of diflubenzuron and may experience population reduction during treatment years. Indications are that some crustaceans, including several cave isopods and amphipids, may be vulnerable to applications of Dimilin (appendix B).

Diflubenzuron may later reduce populations of a few night-flying insects (primarily macrolepidopterans) which are utilized as food source by Virginia bid-eared bat, Indiana bat, Keen's myotis, small-footed bat and Rafinesque's big-eared bat. Such a reduction would be temporary in the treated area.

Fish and Aquatic Ecosystems

Impacts of alternative 3 on fish and other aquatic organisms will be similar to those described for alternative 2 except for treatments with diflubenzuron.

Willcox and Coffey (1978) summarized several studies which investigated effects of diflubenzuron on fish under laboratory conditions and concluded that diflubenzuron is not toxic to fish.

-- Diflubenzuron had no effect on growth of trout from eyed-egg to early fingerling stage at concentrations of 2.9 to 3 ppm.

-- Following a 20-day exposure period, 90-98 percent of diflubenzuron residues were eliminated in bluegill after five days. Residues in trout declined 65-93% after 15 days.

-- Reproductive capacity in fathead minnows exposed to five levels of diflubenzuron was no different from control groups. Fry survival, behavior and hatchability of first and second generations were also similar to control groups.

Following exposure to diflubenzuron in ponds, bluegill and white crappie (Apperson 1978), black crappie and brown bullhead (Colwell and Schaeffer 1980) growth rates and condition factors remained similar to control populations. Schaeffer et al (1979) observed that diflubenzuron was being metabolized by bluegill and white crappie at a high rate by 72 hours. The amount of diflubenzuron remaining in fish tissues, however, was dependent on residue concentrations in surrounding water.

Kingsbury et al (1987) observed that diflubenzuron was not accumulated by and did not increase mortality of creek chub.

Statistically significant effects on glutamate oxalacetate transaminase (GOT) serum levels in rainbow trout were evident at 100 ppm concentrations of diflubenzuron (Madder and Lockhart 1978).

Indirect effects of diflubenzuron on fish are related to the degree insects (food supplies) are affected. Diflubenzuron has been found to reduce populations of certain sensitive nontarget crustaceans, primarily water fleas, cyclops and immature copepods as well as certain species of aquatic insects (mayflies, corixids and notonectids); (Willcox and Coffey, 1978). The effect of diflubenzuron is extremely variable, is non-persistent in the environment and population recovery of the more sensitive species occurs within 14 to 28 days in most cases (Willcox and Coffey, 1978); however, no short-term population trends were evident in aquatic invertebrates investigated by Blumberg in 1986, and populations of even the most severely affected organisms were well-established three months after treatment (Kingsbury 1987). Effects on stream invertebrates which are included in the diet of a variety of fish are thought to be insignificant in streams investigated by Jones (1987), Huber (1987) and Huber (1988). Huber (1988) observed an increase in drift of aquatic insects in response to diflubenzuron application but this induced drift did not approach naturally occurring drift levels.

A recently completed study of invertebrates in headwater streams (Jones, 1987) conducted in West Virginia focused on Ephemeropters (mayflies), Plecoptera (stoneflies) and Tricoptera (caddisflies). These insects utilize feeding strategies likely to bring them into contact with insecticides applied to forest foliage. Taxonomic richness (no. of species) for each group of insects (E,T or P) was not indicated to be affected by diflubenzuron applications. Observed concentration levels of diflubenzuron however exceeded acute and chronic toxicity doses for intolerant taxa for a short period of time.

Several studies have looked specifically at effects of Active Ingredient (A.I.) concentrations of diflubenzuron on population levels, reproductive capability (fecundity) and post treatment generation response of crustaceans in a variety of situations. Ali & Mulla (1978) observed severe fluctuations of all cladocerans (daphnia and others), copepods (Cyclops and others), Hydrachnellid mites and numphs of Caenis spp (mayflies) in a sealed, catch basin-style pond where diflubenzuron was applied directly to water (a method not available under AIPM) at a rate of approximately 2.2 oz. A.I./acre (2-4 times normal application rates). Antia et al (1985) concluded that diflubenzuron was injurious to juveniles of harpacticoid copepod (Thalarsiosira nordenshioldii) under laboratory conditions at diflubenzuron concentrations of .1 ppm (expected maximum concentration level immediately following application) to 10 ppm. Diflubenzuron hardly affected photosynthesis or autotrophic growth of all diatoms examined in Antia's investigation at any concentration level (.01 to 50 ppm). Nimmo et al (1978) observed acute and chronic toxic response of estuarine mysid shrimp (Mysidopsis bahia) under laboratory conditions at diflubenzuron concentrations of .075 to 1 ppm. Reproductive capability was suppressed in post treatment generations exposed to single dose (reduced number of adults) and chronic sublethal doses (reduced fecundity) of diflubenzuron. Hansen and Garten (1982) observed no response of 5 species of mayflies, 7 species of stoneflies, 4 fly species, 3 caddis fly species and 4 species of beetles to .1 ppm concentrations of diflubenzuron in a laboratory stream community.

Soil

None of the intervention tactics in this alternative are likely to have an effect on the soil or litter in selected project areas. Diflubenzuron is rapidly degraded in about three to four days once it gets into the soil. This rapid degradation is unrelated to soil type, but very much related to microbial activity. Studies have shown that 111 types of soil bacteria can utilize diflubenzuron as a sole carbon or sole carbon and nitrogen source (Willcox and Coffey, 1978). No indirect or cumulative affect on soil or litter is anticipated from implementation of this alternative.

Water Quality

The addition of diflubenzuron to this alternative, along with the gypsy moth specific and biological tactics, is not expected to affect water quality. The persistence of diflubenzuron in water is a function of microbial activity, pH, temperature and suspended organic matter and is generally short term with a half life of less than 24 hours (Willcox and Coffey, 1978). No indirect or cumulative impacts on water quality is anticipated with implementation of this alternative.

Air Quality

No significant direct, indirect or cumulative impacts on air quality would be anticipated from any of the intervention tactics proposed in this alternative.

Visual Resource

Visual and scenic values, depending on the intervention tactic used, should be maintained at their current levels within the General Project Area. Some light defoliation may occur in areas where the inherited sterility technique is implemented. No major indirect or cumulative effects on visual resource as discussed under alternative 1 are anticipated from implementing this alternative.

Recreation

This alternative should help maintain recreational use at or near current levels in high-value parks, recreation areas and commercial campgrounds within the General Project Area. Some temporary decline in use may result if parks or recreation areas are closed during treatment operations. Other visitors or users may choose to avoid areas treated with diflubenzuron, but residues of this insecticide on objects, such as picnic tables, will degrade to non-detectable levels in about one week (Cameron et al 1985).

The effect of this alternative on dispersed recreation would be minimal. Foliage should be maintained in most of the areas treated. Visitors involved in hiking, fishing, hunting, viewing scenery, or other activities would probably be unable to distinguish treatment areas.

No indirect or cumulative impacts on developed or dispersed recreation is anticipated from implementation of this alternative, and the impacts described in alternative 1 would generally be prevented.

Cultural and Historical Resources

No effects on the cultural and historical resources are anticipated under this alternative.

Public Health

Under this alternative, the potential impact of the gypsy moth specific and biological tactics on human health are the same as those discussed in alternative 2. The addition of diflubenzuron to this alternative and its potential effects on public health are discussed in detail in the USDA FEIS 1985a. The updated risk assessment for using diflubenzuron from this 1985 document is contained in appendix C of this EIS. Diflubenzuron is an insect growth regulator which interferes with the synthesis of chitin, a substance found in the body wall of insects. Chitin synthesis does not occur in higher organisms; therefore, diflubenzuron has very low mammalian and nonmammalian toxicity exclusive of insects and some aquatic organisms. The acceptable daily intake (ADI) has been set by the Environmental Protection Agency (EPA) at 0.02 mg/kg/day for humans. All possible exposures to the general public are below the ADI.

The toxicity of a chemical is measured by feeding the compound to a population of laboratory animals. The concentration of the chemical that gives a lethal dose to 50 percent of the population of test animals is called the oral LD_{50}. The smaller the oral LD_{50} concentration, the more toxic is the chemical. Although the LD_{50} of diflubenzuron is unknown, the highest dose tested puts it in the slight toxicity category, along with several household chemicals displayed in table IV-2 (Walstad and Dost 1984).

Chronic Toxicity. The major toxic effect observed in test subjects upon exposure to diflubenzuron is the formation of sulfhemoglobin and methemoglobin pigments in the circulatory system. Hemoglobin in its nonoxidized state is essential for the transport of oxygen, whereas the oxidized form, methemoglobin, plays no role in oxygen transport. Investigators have suggested that there is a correlation between increased levels of methemoglobin and increased levels of sulfhemoglobin.

Table IV-2.--Toxicity of diflubenzuron and common chemicals

Toxicity Category	Chemical Substance	Oral LD_{50} (rats: mg/kg)
Very slight	Alcohol (ethyl)	13,700
Slight	Diflubenzuron	>4,640
	Table salt	3,750
	Aspirin	1,700
Moderate	Caffeine	200
Severe	Nicotine	50

Source: Walstad and Dost, 1984

An 80-week mouse feeding study established a NOEL of 1.1 mg/kg/day based on the formation of methemoglobin and sulfhemoglobin in the test animals (USEPA, 1984c). A 104-week rat feeding study resulted in a NOEL of 40 ppm (2 mg/kg/day) with increased levels of methemoglobin and sulfhemoglobin observed in test animals (USEPA, 1984c). A lifetime oncogenic mouse feeding study also established a NOEL of 16 ppm (2.4 mg/kg/day) based on increased levels of methemoglobin and sulfhemoglobin (USEPA, 1984c).

Teratogenicity and Reproduction. Teratology studies in rats and mice did not result in teratogenic effects at the levels tested (USEPA, 1984c). Maternal toxicity, fetal toxicity, and teratogenic NOELS were established as being greater than 4,000 mg/kg/day (highest dose tested) for both test species (USEPA, 1984c). A three-generation rat reproduction study resulted in no reproductive toxic effects at 10, 20, 40 and 160 ppm (0.5, 1, 2, and 8 mg/kg/day) (USEPA, 1984c; Uniroyal, 1983).

Mutagenicity. Diflubenzuron was found to be nonmutagenic even at high doses (Quarles et al., 1980; MacGregor et al., 1979; and USEPA, 1984c). Concentrations of 500 mg/kg body weight did not produce a mutagenic response in hamster fetal cells (Quarles et al., 1980). Negative results also were obtained for diflubenzuron in the mouse micronucleus test in vivo, the mouse lymphoma mutation assay, and the bacterial Ames mutation assay (MacGregor et al., 1979).

Oncogenicity. No evidence of oncogenicity was observed in any test animals at doses as high as 1,000 ppm (150 mg/kg/day) in the lifetime oncogenic mouse study (USEPA, 1984c). A second oncogenic study that used rats also produced no oncogenic effects even at 10,000 ppm (500 mg/kg/day) (highest dose tested) (USEPA, 1984c). Although diflubenzuron has not been shown to be carcinogenic, one of its metabolic breakdown products, 4-chloroaniline, has been claimed to be a carcinogen. This possibility is discussed in appendix C in the section on cancer potencies.

Socio-economic Effects

This alternative, like alternative 2, would reduce the socio-economic effects as described under alternative 1. Although some salvage may occur, the adverse

effects on local and regional markets would be reduced. Near normal timber growth and removals should continue throughout the area.

Prime Farmland and Rangeland

Alternative 3 will have no direct effects on prime farmland or rangeland since this is not the habitat of the gypsy moth. It is possible that during the treatment of adjacent infested forest stands that farm or rangeland may receive minor amounts of insecticides due to drift. In the case of diflubenzuron, as with all insecticides, mitigation measures will be implemented to minimize or prevent insecticide drift into these non-target areas. In those cases where minor drift does occur despite mitigation measures employed, all levels encountered on food crops would be below the ADI (Acceptable Daily Intake) set for diflubenzuron (appendix C). Any diflubenzuron ingested by domestic range animals would have no adverse effects and would be quickly excreted by the animals (Willcox and Coffey 1978). No additional, significant indirect or cumulative effects are anticipated with implementation of this alternative.

Wetlands and Flood Plains

AIPM intervention tactics will not physically impact or alter wetlands and flood plains.

Consumers, Civil Rights, Minority Groups and Women

None of these groups are likely to be impacted or affected by implementation of this alternative directly, indirectly or cumulatively.

Wilderness

Same as alternative 2.

ALTERNATIVE 4

For the General Project Area, alternative 4 contains the same intervention components as alternative 3. Therefore, the estimated direct, indirect and cumulative effects of implementing this alternative would be the same as those discussed in alternative 3.

In wilderness, gypsy moth-specific tactics could be used.

Wilderness

Natural Integrity

The existing wilderness environment would be directly affected by gypsy moth intervention tactics and would reflect human influences rather than natural processes.

The direct, indirect and cumulative impacts of this alternative will be to perpetuate the existing wilderness ecosystem as long as intervention tactics are continued and are successful.

Apparent Naturalness

Apparent naturalness would be enhanced under this alternative. Intervention would preserve existing vegetation, wildlife, soil and water quality.

The application of intervention tactics would not be readily apparent to wilderness users in the case of aerial application of NPV or disparlure flakes except during the application process. Aircraft and ground support personnel affect apparent naturalness during time of application. Ground intervention tactics such as the placement of traps or disparlure tape would be readily apparent and contrast with the natural surroundings because of the way they work and the numbers required to be effective.

The indirect and cumulative effects of this alternative would be readily apparent. As long as intervention tactics were effective, the existing ecosystem would reflect the apparent natural conditions that occur now. Ground intervention tactics, however, would be especially apparent. The placement of traps, disparlure tape and the release of sterile male moths and eggs, and parasites requires that these tactics to be distributed, checked, serviced or replaced off of established trails. Trampling of vegetation, soil erosion, due to trampling from ascending/descending steep slopes (digging in of boots), walking on wet/muddy soils and the marking of paths (through the use of flagging, cutting of brush, markers, etc.) to the intervention site could cause a proliferation of undesired user trails. Once these trails become recognized, they attract additional use and the end result is a pronounced trail that is neither properly designed or maintained. Impacts from the potential creation of trails could adversely effect the wilderness ecosystem and could become readily apparent to the wilderness user by contrasting with the natural surroundings.

Opportunities for Primitive Recreation

This alternative would not significantly impact the opportunities for primitive recreation experiences. These existing opportunities would be preserved from the impacts of gypsy moth. However, during periods of intervention, visitors may choose not to use the wilderness because of the intervention tactics applied there, and thus the opportunity to participate in these kinds of wilderness experiences would be lost to them. These impacts will be temporary, during the spring and early summer when intervention tactics are applied.

Opportunities for Solitude

Alternative 4 should perpetuate this attribute if intervention protects the existing vegetative screening. The physical attributes which provide for solitude should not be significantly changed. However, frequent intrusion by AIPM personnel to place and maintain ground intervention tactics will increase the likelihood of contact with wilderness users. Increased frequency of contact is likely to be viewed as an intrusion on one's ability to find solitude in wilderness. Aerial applications of NPV and disparlure flakes would impact this wilderness attribute only when the application process takes place.

The indirect and cumulative impacts of this alternative would be increased human contact between wilderness users and AIPM personnel. It can be expected that due to this increased level of contact, a number of users may seek out other areas for solitude. Opportunities for solitude are expected to decline overall under this alternative.

Supplemental Attributes

The effect of this alternative would be to maintain the number and size of old growth trees in wilderness. Natural processes in the absence of gypsy moth would allow a mix of old growth trees and young trees to become established. There should be no impact to other geological, cultural, historical or ecological features.

The scientific value of wilderness as a base line area would be diminished. Wilderness will reflect human intervention tactics on gypsy moth, instead of how nature reacts to the pest.

Scenic Values

Treated areas should preserve existing scenic values associated with wilderness and characteristics of the existing landscape. Some defoliation and mortality would be expected to occur under this alternative, but would be considered insignificant.

Intervention tactics that employ physical means, such as traps or disparlure tape, will also impact the visual resource. The number, size, and color of these intervention tactics will contrast with the natural environment and can be considered obtrusive in nature.

The indirect and cumulative effects of this alternative would reflect existing scenic values, that being one of a treated nature for gypsy moth.

ALTERNATIVE 5

For the General Project Area, alternative 5 contains the same intervention components as alternatives 3 and 4; therefore, the estimated direct, indirect and cumulative effects of implementing this alternative would be the same as those presented in alternatives 3 and 4. In wilderness, gypsy moth-specific tactics and biological tactics could be used.

Wilderness

Natural Integrity

The direct effects on natural integrity would be similar as those in alternative 4, but additional impacts would occur with the use of the biological insecticide Bt. It can be expected that lesser amounts of defoliation and tree mortality would occur due to reduced population levels of gypsy moth. However, Bt has been shown to adversely affect some nontarget organisms, such as other Lepidoptera species.

It can be concluded that Bt can reduce, at least temporarily, the population levels of non-target Lepidoptera species.

The direct, indirect and cumulative effects of implementing this alternative upon the wilderness ecosystem would reflect human influences and reduce the population of nontarget Lepidoptera species of the area. Repeated applications of Bt through successive years could directly impact native Lepidoptera and possibly alter their ecological role in the wilderness environment. Further reductions in the amount of defoliation and tree mortality, however, would occur under this alternative.

Remaining Attributes

The types of direct, indirect and cumulative effects on these attributes would be the same as in alternative 4.

ALTERNATIVE 6

For the General Project Area, alternative 6 contains the same intervention components as alternatives 3, 4 and 5; therefore, the estimated direct, indirect and cumulative effects of implementing this alternative would be the same as those presented in alternatives 3, 4 and 5. In wilderness, gypsy moth-specific, biological and diflubenzuron tactics could be used.

Wilderness

Natural Integrity

The direct effects on natural integrity would be similar to those in alternative 4 and 5, but additional impacts would occur with the use of the chemical growth regulator diflubenzuron. It can be expected that lesser amounts of defoliation and tree mortality would occur due to reduced population levels of gypsy moth. However, diflubenzuron has been shown to adversely affect some nontarget organisms such as canopy leaf-eating insects, crustaceans, water fleas, cyclops, copeods and certain species of aquatic insects (mayflies, corixids, and notonectids), (USDA FEIS 1985). It can be concluded that diflubenzuron may reduce the diversity of nontarget insects in the wilderness environment.

The direct, indirect and cumulative effects of implementing this alternative upon the wilderness ecosystem would reflect human influences and reduce the biological diversity of the area. Repeated applications of diflubenzuron through successive years could directly impact native non-target organisms that are susceptible to this chemical growth regulator and possibly alter their ecological role in the wilderness environment. Further reductions in the amount of defoliation and tree mortality, however, would occur under this alternative.

Remaining Attributes

The types of direct, indirect and cumulative effects on these attributes would be the same as under alternatives 4 and 5.

RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Short-term uses are those activities that generally occur on a yearly basis or will not be significant beyond the 5-year program. Long-term productivity are those actions or activities that have an effect or influence beyond this time frame.

The National Forest Management Act, Forest and Rangeland Renewable Resources Planning Act and Multiple Use Sustained Yield Act dictate that national forests must be managed to protect long-term productivity of the land. Other laws (such as the National Park Service Organic Act, 44 STAT.616 and 50.STAT.700) require that National Park lands be managed in such a manner that will leave them unimpaired for the enjoyment of future generations.

Most management decisions and resource outputs are by nature short-term but may affect maintenance of long-term productivity. Generally, management requirements and mitigating measures reduce or eliminate potential effects on long-term productivity by protecting resources like soil, water, wildlife, threatened and endangered plants and animals, and visual quality.

Monitoring requirements which apply to all alternatives ensure that long-term productivity is not impaired by short-term uses or activities. If monitoring discloses that management requirements and mitigation measures are inadequate, treatment will be discontinued until new mitigating measures are developed.

Vegetation

Alternative 1 (no action) would have the greatest impact on the forested resources over time. As the gypsy moth spreads into and through the AIPM Project Area, susceptible trees will be killed. Mortality in some stands will be heavy and may occur over large areas. The resulting losses would include both current production and future growing stock of desired forest species. Less susceptible gypsy moth tree species, however, will gradually replace the susceptible oaks as the future growing stock of the area. These species will eventually become the dominant forest type and will affect timber management activities and decisions.

Alternatives 2 to 6 would permit intervention to minimize or reduce impacts on short-term productivity. Impacts on long-term productivity may not be minimized, since the AIPM Project is scheduled to run 5 years, and the level of intervention cannot be predicted beyond that period. However, one of the goals of the project is to identify intervention tactics that could be implemented further into the future to reduce impacts on long-term productivity.

Soil

Alternatives 2 through 6 would permit intervention which would reduce gypsy moth-caused defoliation and associated hardwood mortality. None of the intervention tactics would directly affect soil productivity in either the short- or long-term period. Reduced tree mortality would minimize the need for timber salvage operations.

Water Quality

None of the alternatives involve short-term uses or water that would affect long-term productivity. There may be some short-term effects on water quality under all alternatives due to defoliation and increases in water yields. The potential for increases in water yields are most likely under alternative 1 because there would be greater acreages of untreated forested areas. However, increased water yields may also occur if treatment is ineffective under alternatives 2-6. Long-term effects are not anticipated under any of the alternatives, as the defoliated areas will regenerate and water yields will return to predefoliated levels.

Recreation

Alternative 1 (no action) would create the greatest potential for reduced recreation use in the short term. Uncontrolled gypsy moth populations in developed recreation areas would result in increased defoliation and insect nuisance. In the long term, this alternative would have no significant impacts on visitor use.

Alternatives 2 through 6 would prevent or minimize the reduction in visitor use in the short term and have no significant impacts on the long term recreational opportunities.

Socio-economic Effects

Timber mortality and salvage operations associated with alternative 1 may increase the supply of timber available in local markets. If the supply exceeds demand, stumpage prices will decline, reducing the income timber owners or managers receive in the short term. The production of high quality oak products may decrease in the long term, but the production of less gypsy moth-susceptible pine and hardwood timber would allow long-term productivity to be maintained.

Alternatives 2 through 6 would tend to minimize the effects associated with alternative 1 in the short term by preventing much of the hardwood mortality and salvage operations. This will help maintain stable timber markets and associated incomes at current levels. If appropriate intervention methods continue into the future, long-term socio-economic impacts should also be minimized.

RELATIONSHIP TO PLANS OF OTHER AGENCIES

Chapter VI of this document identified agencies that were contacted during the scoping process to inform them of the AIPM Project and how it may be coordinated with their respective plans. As cooperating partners, the Forest Service, National Park Service, Virginia Department of Agriculture and Consumer Services and West Virginia Department of Agriculture have been a continuing part of the project's conception and development. Additional agencies have provided information in the preparation of this environmental impact statement:

- Fish & Wildlife Service has assisted with data and requirements for compliance with the Endangered Species Act;

- Animal & Plant Health Inspection Service has assisted with information on the inherited sterility tactic and planned additional developmental work on this tactic in areas of the AIPM Project:

- Pennsylvania Game Commission assisted with information on gypsy impacts on game species;

- Finally, Chapter VI contains a list of other agencies which will review this document.

No apparent conflicts with other agency plans have surfaced during the development of this EIS. However, the possibility of conflict with other agency missions and objectives could arise. Resolution of these conflicts can occur through amending the agency's plan (as in the case of National Forest Land and Resource Management Plans), the intervention tactic chosen, or by exercising the option of not participating in the AIPM program.

The AIPM Program Manager and Staff will coordinate and/or approve all gypsy moth management activities occurring within the AIPM Project Area.

For gypsy moth treatment activities that may occur in the AIPM Project Area that are privately funded or funded under another program, AIPM will coordinate with the landowners or officials responsible for each planned project. Since

participation in the AIPM Program is voluntary, and AIPM does not preclude any actions proposed with private funding or under other current programs (see discussion under Current Programs section in Chapter I of the FEIS), a coordinated and cooperative effort will be necessary. Coordination with these activities, if they occur, will help maintain the integrity of the AIPM Project so valid conclusions can be drawn regarding methods improvement work and overall success or failure of the AIPM Project or aspects thereof. It is also necessary so the potential Project-wide or cumulative environmental impacts of gypsy moth management actions proposed under AIPM and those proposed under private or other Program funding can be evaluated. Projects funded by AIPM may be modified or deferred to minimize or reduce the overall potential environmental impacts.

AIPM Program Manager and Staff will review and approve all gypsy moth management action proposed by various land managers to be funded by AIPM in the Project Area. This will insure adherence to the policy and procedures outlined in the annual program of work and this EIS. In addition, this review will allow for an overview of all the projects proposed in the AIPM Project Area and an evaluation of the potential Project-wide or cumulative environmental impacts of all AIPM Projects. AIPM Program Manager or AIPM Staff can, as needed, coordinate any proposed recommended changes with the appropriate land manager so the intended objectives are met while minimizing or reducing the overall potential environmental impacts.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible Commitments

Irreversible commitments of resources result in the loss of future options. It pertains primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time. It is doubtful that any irreversible commitments of resources would occur as a result of selecting an alternative in this AIPM Program EIS. The irreversible commitments of resources may occur at the project level and will be identified in the site-specific analysis.

The potential irreversible commitments of resources that could occur at the project level are:

Wilderness

If no action is taken, the gypsy moth infestation in wilderness could create an immediate and future condition due to an exotic insect introduced by man. This nonaction commitment of the wilderness resource is irreversible.

If action is taken to manage the gypsy moth in wilderness, human actions would irreversibly alter the wilderness resource.

Irretrievable Commitments

Irretrievable commitments of resources pertain to loss of production, harvest, or use of natural resources. For example, some or all of the habitat required by sensitive wildlife species needing a remote, quiet environment is lost irretrievably while an area is serving as a winter sports site. The production or use of the area to support such wildlife is irretrievable, but the action is not irreversible. If the use changes, it is possible for the area to resume its

original condition favorable to production of remote wildlife species. It is doubtful that the selection of an alternative for the AIPM Program will cause any irretrievable commitments of resources. Irretrievable commitments of resources could occur at the project level if action is taken. These irretrievable commitments will be identified in the site-specific analysis.

The potential irretrievable commitments of resources that could occur at the project level are:

Socio-economic

If gypsy moth is not managed, merchantable timber killed by gypsy moth and not salvaged, and the decrease in log value for salvage timber, as opposed to live timber, represents an irretrievable loss. Tree mortality is expected to be greater under a no action alternative than under other alternatives that include intervention tactics. Therefore, the irretrievable loss of timber value will likely be greater when gypsy moth is not managed. Differences in timber loss between the other alternatives cannot be predicted.

Vegetation and Wildlife

Gypsy moth will also feed on non-merchantable vegetation. The resulting changes in the habitat will have impacts, either directly or indirectly, on wildlife. Loss of wildlife due to mortality and relocation, and decreases in reproduction represent an irretrievable commitment of the wildlife resource. Impacts to vegetation and resulting impacts to wildlife are expected to be greater initially if gypsy moth is not managed.

Recreation and Visual Resources

Loss of high quality recreational opportunity and visual resources will be greater for areas infested with gypsy moth that are not treated. These losses represent irretrievable commitments of resources that will be greater if gypsy moth is not managed. Differences in recreation opportunity and scenic value loss cannot be predicted.

Other Resource Commitments

Labor, material, and dollars committed to implementation of an alternative that otherwise would have been available for investment elsewhere are irretrievable. Opportunity to use these resources for another purpose is foregone. This irretrievable opportunity is greater if action is taken than if it is not.

Energy expended in implementation of an alternative is an irreversible commitment of resources. No action would expend less energy than taking action.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Adverse environmental effects are unavoidable despite mitigation measures in all of the alternatives. Some effects are related to alternative 1, while others are produced where gypsy moth intervention activities occur. These effects are:

Vegetation

Tree mortality associated with defoliation by gypsy moth could occur in susceptible stands. In heavily defoliated areas, long-term effects would be a

change in forest tree species from susceptible oaks to other less gypsy moth susceptible species.

Wildlife and Wildlife Habitat

In areas where gypsy moth is allowed to run its natural course, changes in wildlife habitat will produce changes in wildlife abundance, distribution and animal community composition.

Insects

Insects will be impacted under all alternatives. Gypsy moth larvae will compete with native insects that utilize the same food source. Displacement of these native species would occur. Insecticide use would affect the population of susceptible non-target organisms when used as an intervention method on gypsy moth (alternatives 2 through 6).

Endangered, Threatened and Sensitive Species

Potential adverse effects associated with gypsy moth defoliations would occur if a no treatment prescription is selected for sites that support populations of Virginia northern flying squirrel, Virginia big-eared bat, Indiana bat, bald eagle, cheat mountain salamander, Shenandoah salamander, Madison Cave isopod, swamp pink, running buffalo clover, shale barren rockcress or harperella.

Potential adverse effects associated with applications of Bt and diflubenzuron would occur if prescriptions containing treatments with Bt and diflubenzuron are selected for sites that support populations of Virginia big-eared bat, or Indiana bat.

Water

Water quality will be affected during periods of heavy rain. The taste, odor and color of water will be altered by accumulations of insect larvae, frass and leaf parts into small streams in heavily defoliated areas.

Visual Resource

Visual quality is impaired when defoliation by gypsy moth occurs.

Recreation

Insecticide use will lower the visitor use during time of application in developed sites. Untreated areas will also have lower use rates due to the nuisance problems created by gypsy moth. Heavy mortality of trees in developed sites will produce undesirable effects on the recreational experience due to hazardous trees and denial of the forest environment expected by the user.

Socio-Economic Conditions

Alternative 1 will have the greatest impact on this resource. Local timber markets will be affected if extensive mortality occurs. Significant reductions in the rate of return from forest investment will alter forest management practices and the prominence of forest-related economics.

Wilderness

Wilderness attributes will be impacted from gypsy moth (an exotic insect) and by intervention activities employed against the gypsy moth.

IDENTIFIED RESEARCH NEEDS

No critical data gaps or missing information was identified that would prevent the implementation of any alternative discussed in this EIS. Where noncritical information needs were identified, this information was added to the following research needs list. It is anticipated that in the course of the AIPM Project that funds will be provided to address the various items contained in this list. The list is presented in priority of need (as determined by analysis of the replies received during the scoping process and comments received on the DEIS:

1. Determine the direct and indirect effects of diflubenzuron and Bt on nontarget organisms (including other Lepidoptera, T,E&s species, food supplies of other animals, etc.) in the Project Area.

2. Determine the effects of residual diflubenzuron (up to 60 days or longer after application) against immature and older gypsy moth caterpillars and nontarget Lepidoptera caterpillars.

3. Determine the effects of residual diflubenzuron and its metabolites on soil and aquatic ecosystems.

4. Determine the effects of gypsy moth defoliation on habitat and food supplies for:

   a. Endangered or threatened species;

   b. Game species (including fish);

   c. Aquatic organisms.

5. Improve field-residue monitoring techniques for all three insecticides.

6. Determine the effects of gypsy moth defoliation on native leaf-eating insects.

7. Improve the NPV formulation to increase the efficacy against all gypsy moth population levels.

8. Determine the field effective dose of disparlure tape and flakes to achieve mating disruption.

9. Develop a more competitive strain of gypsy moth for use in the inherited sterility technique.

10. Determine the most effective overflooding ratios of the F1 inherited sterility technique for use in areas adjacent to the generally infested area.

11. Improve Bt strain.

LIST OF PREPARERS

CHAPTER V

LIST OF PREPARERS

AIPM Project Interdisciplinary Team

The project interdisciplinary (ID) team members listed below were responsible for integrating knowledge of the physical, biological, economic and social sciences for this EIS. Team members were responsible for identifying and analyzing issues, developing options for issue resolution and alternative actions, analyzing public comments and preparing responses. (Further interdisciplinary functions are described in 36 CFR 219.6).

Core ID Team Members

Name: David P. Smith

Position: Team Leader, AIPM EIS Team, USDA Forest Service, Southern Region Forest Pest Management, Atlanta, GA 30367.

Experience and Education: Twelve years service in positions involving timber management, silviculture, recreation and other forest resources. Assignments were on Forests in South Carolina, Mississippi, Illinois and Regional Office in Atlanta, Georgia. Served as Team member and Team Leader that prepared the EIS for Suppression of the Southern Pine Beetle-Southern Region. From 1973 to 1976, served as a park planner with the Maryland Department of Natural Resources, Annapolis, MD. Certified silviculturist in Southern Region. Holds B.S. in Forestry from Southern Illinois University, Carbondale, IL.

EIS Responsibility: Team Leader for interdisciplinary team preparing the EIS.

Name: John H. Ghent

Position: Entomologist, USDA Forest Service, Southern Region, Forest Pest Management, Asheville, NC 28804.

Experience and education: In current position since 1976. Twelve years experience with USDA Forest Service. Holds a B.S. in biology from Catawba College, Salisbury, NC and M.F. in forest protection from Duke University, Durham, NC.

EIS Responsibility: Wrote updated Risk Analysis for diflubenzuron. Provided technical input and review on toxicological information for insecticides.

Name: John W. Hazel

Position: Forester, USDA Forest Service, Eastern Region, Milwaukee, WI. 53203.

Experience and education: Thirteen years with USDA Forest Service in positions involving forest administration, forest planning, wild & scenic rivers, timber management and other forest resources. Duty assignments were on National Forests in Texas, Ohio, West Virginia and Regional Office in Milwaukee, WI. Received BSF, West Virginia University, 1971. R9 Continuing Education Program, 1982.

EIS Responsibility: Major participant in development and compilation of the draft EIS.

Name: Gary M. Peters

Position: Wildlife Biologist, USDA Forest Service, Wayne-Hoosier National Forest, Bedford, Indiana 47421.

Experience and education: Twelve years with the USDA Forest Service in positions including fish and wildlife, endangered and threatened species, special areas, timber management, land management planning, cultural resources and pesticide administration responsibilities. Currently in continuing education program for wildlife biologists, A.A.S. Wildlife Management, Hocking Technical College 1975, B.S. Public Affairs/Environmental Science, Indiana University 1983.

EIS responsibility: Evaluate effects of gypsy moth and AIPM Project on fish and wildlife, endangered and threatened species and insects. Contribute to the development, compilation and presentation of the EIS.

Name: John C. Romanowski

Position: Forester, AIPM EIS Team, USDA Forest Service, Southern Region, Forest Pest Management, Atlanta, GA,30367.

Experience and education: Ten years service with the USDA Forest Service involving positions in wilderness, recreation, other forest resources and watershed management. Assignments were on National Forests in Georgia, Virginia and Mississippi. Holds a B.S. degree in Forest Management, University of Vermont, Burlington, VT.

EIS Responsibility: Evaluated the effects of gypsy moth and gypsy moth intervention alternatives on wilderness characteristics and values. Major participant in development and compilation of EIS.

Name: Robert D. Wolfe

Position: Staff Pathologist, USDA Forest Service, State and Private Forestry, Forest Pest Management, Broomall, PA 19008.

Experience and education: In present position since 1976. Twenty-four years employment with the USDA Forest Service. Previous assignments were at Macon, GA, Alexanderia, LA, and Asheville, NC. Holds a BS degree in Biology and a MF in Forest Pathology from Duke University, Durham, NC.

EIS Responsibility: Major participant in development and compilation of EIS.

Staff Support

Name: Saranel Winkler

Position: Program Assistant, AIPM EIS Team, USDA Forest Service, Southern Region Forest Pest Management, Atlanta, GA 30367.

Nineteen years experience with Forest Service involving positions in State & Private Forestry, Fiscal, Recreation, Engineering, and most recently worked with the interdisciplinary team in preparation of the Southern Pine Beetle Environmental Impact Statement.

PUBLIC PARTICIPATION AND CONSULTATION WITH OTHERS

CHAPTER VI

CHAPTER VI

PUBLIC PARTICIPATION AND CONSULTATION WITH OTHERS

A. Public Involvement Summary

The Forest Service has encouraged public participation throughout this EIS preparation. Steps taken to keep the public informed and involved are:

Notice of Intent - A notice of intent to prepare this EIS was published in the March 10, 1988 Federal Register. This notice invited public comment and suggestions to help determine the issues and sub-issues to be addressed in the EIS.

Letter to the Public - The public was asked to identify issues through the use of a post paid mailer sent in March, 1988. Approximately 3,000 of these mailers were distributed to interested individuals and organizations who have expressed interest in management of the National Forests in the AIPM Project area as well as the Shenandoah National Park. These individuals and organizations were obtained from lists kept by the National Park and National Forests and merged into a master list to obtain the broadest possible coverage.

Media - A press release by the Regional Public Affairs Office was distributed to regional media and to local media by individual Forest Public Affairs Offices in March, 1988.

Responses - Public responses to the request for comments and suggestions on issues were placed into 7 categories:

1. Educational Groups
2. Elected Officials
3. Federal Government
4. Individuals
5. Interest Groups
6. Local Government
7. State Government

A total of 314 responses to the scoping request was received and used to develop the issues to be addressed in the EIS.

Responses were organized into a dozen or so groups based on methods and resources affected. These groups were analyzed for major themes and condensed into major issues (Chapter I). The alternatives and mitigating measures were developed to respond to these issues.

A monthly newsletter was developed (Appalachian Gypsy Moth IPM Demonstration Project News) to report on the progress and results of the AIPM project. The July, September, October, November and December newsletters (Volume 1, Issues 3, 5, 6, 7 and 8) specifically discussed the EIS process.

On August 20,1988, a presentation on the AIPM project and EIS process was made to the Appalachian Regional Conservation Committee of the Sierra Club. This presentation was requested by the club so that input could be developed and sent to the EIS Team.

Notice of Availiability - A notice of availiability of the DEIS was published in the November 4, 1988 Federal Register. This notice informed the public that the DEIS was available for review and comment for a period of 45 days to help determine the issues to be addressed in the FEIS.

Media - A press release by the Regional Public Affairs Office was distributed to regional media and to local media by individual Forest Public Affair Officers in October, 1988. This release was to give notice of the availability of the DEIS for review.

Draft EIS Mailing - Approximately 1,470 copies of the DEIS were mailed to interested individuals, organizations, elected officials, Federal, State and Local governmental agencies.

Public Meetings - A series of 5 public meetings were held within the AIPM Project during the month of November to present the DEIS and inform meeting attendees of the procedure for providing public input. Meetings occurred in the following locations and dates:

November 5, 1988
Blacksburg, VA

November 14, 1988
Petersburg, WV

November 15 ,1988
Elkins, WV

November 16, 1988
White Sulpher Springs, WV

November 17, 1988
Harrisonburg, VA

On December 8, 1988, a meeting was held to help develop criteria for managing gypsy moth populations within wilderness in the AIPM area. Representatives from the Wilderness Society, Virginia Wilderness Committee, Virginia Wilderness Resource Council, Sierra Club, Environmental Action, Forest Service and Legislative Aide to Congressman Olin of Virginia were in attendance. As a result of this meeting a preliminary set of criteria for management of gypsy moth in wilderness was developed.

On January 12, 1989, a second meeting between the Forest Service and the individuals listed above was held and a consensus was reached in this meeting on the circumstances under which treating gypsy moth in wilderness would be considered. This criteria has now been incorporated into the FEIS.

Summary of Public Responses

A total of 73 letters commenting on the DEIS were received and were used to develop the FEIS. The following is a brief tabulation of the responses received on the DEIS:

Who Responded	No.	Area of Response	No.
Individual	41	Georgia	1
Timber Industry	6	Maryland	1
Conservation Group	13	New Jersey	1
Federal Government	5	Pennsylvania	2
State Government	4	Tennessee	1
Local Government	2	Virginia	29
Elected Officials	2	Washington DC	2
		West Virginia	33
Total	73	Total	73

Alternatives Favored, Issues Addressed

A total of 35 respondents stated a preference for a particular alternative or alternatives. However, a number of respondents addressed issues rather than stating a preference for a alternative. Their replies are summarized as follows:

Alternatives	Pro	Con	Modified
1	0	0	0
2	13	0	3
3	6	1	0
4	4	1	1
5	11	1	0
6	11	1	0
Total	35	4	4

The major issues that were addressed most often concerned the use of diflubenzuron as an intervention tactic. Issues were raised concerning the effects diflubenzuron on non-target organisms, human health and the physical environment. There was also a question on whether or not to treat wilderness in the AIPM Area for gypsy moth. These concerns are discussed in the Forest Service's response to each commentor's letter.

Sixty-seven of the responses received on the DEIS are included in the FEIS. The remaining six letters were not received in time to be printed in the FEIS. These letters were considered and a response to the commentor was prepared. In addition, these letters were forwarded to the Responsible Official for consideration.

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J. W. Wade	USDI National Park Service
Ralph Webb	USDA Agricultural Research Service
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William Yendol	Penn State University

C. Consultation with Others

One of the most important parts of the process of preparing this environmental impact statement is information gathering. Advice and contributions from experts are essential for a thorough and complete analysis. The following individuals contributed to this analysis:

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Tennessee
MIKE COOPER, TN DEPART. OF AGRICULTURE

1

04 NOV 1988

11-2-88

MR. SMITH,

UPON REVIEWING THE DRAFT E.I.S. SENT ME I FIND THE WORK COMPREHENSIVE, WELL LAID OUT, AND EASILY UNDERSTOOD.

1 I CAN FIND NO NEED FOR ADDITIONS OR OMISSIONS.

THE PREPARERS DID AN EXCELLENT JOB.

G. LEN ALVIS
A.H.S.R. BOX 227
PIPESTEM, WV. 25979

Response to Comments in Letter No. 1

From: G. Len Alvis

Comment No.	Response
1.	Comment noted.

2

27 DEC 1988

Double W
W W

Williams Brothers & Family
Wildlife Farm

CHRISTMAS EVE. 1988

DEAR PERSONS CONCERNED:

I JUST ARRIVED BACK FROM MY PLACE IN WEST VIRGINIA, DODDRIDGE COUNTY AREA, AND IN REVIEWING MEMORIES OF JUST 20--40 YEARS AGO OF THAT AREA AND THE MORE SOUTH EASTERN PARTS, AS ELKINS, GLADY, SPRUCE LAKE-KNOP, AND THE WAY IT WAS THAN.

NOW IN FROM THEIR, PICKING UP YOUR COPY RECEIVED OF THE DRAFT ENVIRONMENTAL STATEMENT (DRIS) (1950 GMEIS) OCT. 25, 1988. GYPSY MOTH AND MEETINGS IN NOVEMBER-I WOULD LIKE TO MAKE ANOTHER PERSONAL COMMENT--MAYBE ITS THE SEASON AND DISGUST AT HUMAN KIND -IN WHAT WE ARE DOING TO MOTHER NATURE AND HER HOME.

EVERY PROBLEM WE OR YOUR DEPARTMENT ARE FIGHTING --WERE MAN MADE___MOSTLY FROM GREED,
1 EVEN THE CAUSE OF THE GYPSEY MOTH, THE OVER RUNNING OF OUR NATURAL FOREST___HARD WOODS,
STREAM POLLUTION___EVERY SINGLE THING WE DO--EVEN DOWN TO THIS TYPE OF CONTROLLING
THIS STATEMENT IS ALL ABOUT. IT IS A DISGUSTING SHAME.

WE CAN'T CURE THE COMMON COLD, CANCER, AIDS, LEGIONAIRE SICKNESS-THO WE GIVE A REASON, ALL WE CAN DO IS FORM COMMITEE's, TRY TO GAIN POPULAIRTY AS A MEMBER OF IT TO ADVANCE AND FOR WHAT REASON___MORE MONEY OR FAME AND THAT IS GREED --WE ARE AS VULTURES , NOW EATING EACH OTHER, NEXT OURSELVES.

I WALKED ACROSS THIS SMALL PART OF EARTH THAT I RENT OR OWN -- SEEING THE HARD WOODS, WITHERED, DYING, OR STRUGGLING ---SEE THE NEW UP SHOOTS STRUGGLING - KNOWING AFTER JUST A FEW YEARS MORE OF EXPOSIURE , THEY WILL BE DEAD, KNOWING IN JUST A MATTER OF TIME, OUR FOREST___WOODLANDS___EVEN THE BROOMSAGE - MEADOWS I RAN IN AS A KID WITH FRIENDS WILL BE GONE_____LET US BE REALISTIC -- IT IS HAPPENING AND WITH TO MUCH OF A HEAD START ON US TO SPARE COMMENTS.

I REMEMBER JUST 20 YEARS AGO ON A SCOUT TRIP OF GETTING LOST ON MIDDLE MOUNTAIN__FINDING A OLD HERMIT___HIS DEER HIDE SHELTER_POLED FENCE__MULE AND ROOTS DRYING__SPRING WATER, GETTING DIRECTIONS AND SEEING STREAMS OF TROUT--AND HIS STORY TO US OF THE HUMAN INVASION, NOW ON RETURNING TO THE SAME AREA--OR NEAR BY___SEEING THE STREAMS FULL OF BURNT TIRE WIRES--BANKS WORE CLEAN BY TRAVEL --NATIVE FISH AND WILDLIFE____YOU ASK A CAMPER AND THEY SAY___OH YES---I HEARD THE MOUNTAINS USE TO BE FULL---IN SIDE I CRY---YES CAMPER I SAY TO MYSELF----I REMEMBER THOSE DAYS___EVEN IN MY LIFETIME AND I AM ONLY 50 ??????

WITH THE CHEMICALS THAT ARE FORMING ACID RAIN---HOW DO WE KNOW THE RESULTS OF THE CHEM-
ICALS THE SPRAY MADE FROM WILL NOT CAUSE ANOTHER REACTION, LET US BE HONEST____WITH THE
MIXTURES WE ARE PRODUCING TO MANUFACTURE ITEMS WE MAKE--CAR OR FORM OF TRANSPORTATION
EXHAUST---PLUS HOME EXHAUST NOT MENTIONED FROM FURNACE VENTS OR JUST NATURAL HOME HEAT
2 ESCAPE--FALL OUT PLUS---SURE YOUR DEPT. HAS NO DOUBT TESTED--BUT REALLY HAVE THEY
TESTED IT WITH THE REACTION OF SULPHUR AS FROM A COAL CINDER DUMP--FALL OUT OF FUEL
FALL OUT FROM THE MASS OF OVER HEAD JETS NOW DAYS_____THE MANY MIXTURES OF UNLEADED,
LEADED AND ADDITIVES MIXED - EXHAUSTED FALL OUT--

I MEAN---WE ARE TRYING TO STOP THE TIDE WITH A TEA CUP----LOOK AT THE FACTORY IN SPELTER W.VA. AND THE DUMP THAT SHUT IT DOWN--NOW PARTIALLY REOPENED---THAN ON A COMPLETE OTHER

Response to Comments in Letter No. 2

From: Williams Brothers & Family Wildlife Farm

Comment No.	Response
1.	Comment noted.
2.	In searching the scientific literature pertaining to the insecticides proposed for use in the AIPM Project, no evidence or indication surfaced that these insecticides may react with air pollutants that are responsible for acid rain formation.

Double W
W W

Williams Brothers & Family
Wildlife Farm

PAGE 2 (DRIS) COMMENT CHRISTMAS EVE 88

SIDE OF THE PICTURE--LOOK AT TODAYS FOOTBALL GAME IN CLEVELAND, THE WAIST CLEAN UP AFTERWARDS--MOST OF IT TO BE BURNT--WHAT WILL BURN--THE EXHAUST OF AUTO'S OR FORM OF TRANSPORTATION---AND THE RISE OF IT ALL MIXED WITH MANY OTHERS WILL FLOAT THRU AND LAND ON OUR--SURVIVAL NEEDS --OUR GIFTS FROM MOTHER NATURE_____YET------

ARE WE GOING TO STOP ALL THOSE GOOD TIMES, OR ARE WE JUST GOING TO CUT MORE TREES_____MAKE FROM THEM THESE COSTLY REPORTS AND SEND OUT TO THOSE OF US BURIED FROM WHAT WE LOVE, A QUESTIONAIRE , THAT REALLY IS A WASTE BECAUSE YOU ARE GOING ON WITH A FORM OF MORE CHEMICALS TO COVER US AND THE DESTRUCTION ALREADY CAUSED BY GREED.

ITS LIKE GOING IN THE BATHROOM OF A SMALL SIZE____CAUSE NOW EARTH COMPARED TO INDUSTRY TRANSPORTATION, SHELTER AND POPULATION IS SMALL------GOING IN THE BATHROOM--HAVING A LARGE STINKING BM--SCOOTING OUT TO AVOID THE ODER___BUT BUYING A CAN OF LILAC SPRAY TO COVER THE SCENT-----YET IT STILL IS THEIR___MADE FROM THE SAME STUFF--ONLY SMELLS GOOD .....

TO SAVE OUR NATURAL RESOURCES_____WE ARE GOING TO HAVE TO SLOW DOWN AND GO BACK IN TIME TO PRIMITIVE WAYS----AND THAT WE WILL NEVER DO -- SINCE THE BEGINNING OF TIME WE HAVE ADVANCED AND WILL NEVER STOP-----

WE WERE CREATED IN A GARDEN OF WILDLIFE AND NATURE---

THAN WE WERE GUILTY OF EATING FROM THE TREE OF KNOWLEDGE -TODAY CALLED EDUCATION AND OUR CURSE, IF ONLY WE COULD HAVE STAYED AS WE WERE.

I MEAN JUST A FEW YEARS AGO AS A HILLBILLY AND THE FUN BEING MADE OF ME IN OHIO BY THOSE OF MY FRIENDS______OF ONLY BEING TAUGHT THE THREE R'S (READING RITING RITHMATIC)--BUT MY ANSWER TO THOSE WERE----YES--AND JUST A FEW YEARS AGO WE WERE THE NUMBER ONE COUNTRY ON THIS PLANET--NOW EDUCATION HAS ADVANCED UNTILL IT TEACHES THE WHOLE ALPHABET AND LOOK AT THE MESS WE ARE IN----MYSELF----I WOULD LIKE TO GO BACK A FEW HUNDRED YEARS---

HOW ABOUT YOU ?

I DON'T KNOW WHAT THE ANSWER IS //?? WHATS GOING TO BE DONE WILL BE---WE NO LONGER HAVE THE POWER TO STOP___WE HAVE WAITED TO LONG. IF THEIR IS A CREATOR--IN WHICH I BELIEVE THEIR ARE-----HE/SHE THEY OR IT MUST BE SAYING

" I TOLD YOU SO "

OH WELL--AT LEAST I HAVE ENJOYED THE PART I REMEMBER AND WILL BE GONE BEFORE MUCH LONGER, YET I GRIND MY TEETH AT WHAT MY KIDS AND GRANDKIDS MAY HAVE TO LIVE TO SEE OR FEEL....

WHAT A LETTER TO WRITE ON CHRISTMAS ----RIGHT ...???

OH WELL--THE BEST OF WHATS LEFT TO YOU AND YOURS FROM US AND USENS.

GOD BLESS AND THE BEST OF HOLIDSYS AND FUTURE--I KNOW YOUR TRYING, BUT I THINK IN THE WRONG DIRECTION-BURN ALL THE MONEY SEEDS AND PLANT REAL ROOTS OF SOME KIND.

21 NOV 1983

3

County of Rappahannock

Board of Supervisors
John W. McCarthy, County Administrator

P.O. Box 222 703/675-3342
Washington, VA 22747

November 17, 1988

Mr. David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road, N.W.
Atlanta, GA 30367

RE: AIPM Draft EIS

Dear Mr. Smith:

In my review of this document, let me, first of all, grant it high marks for addressing almost all of the concerns that I have heard raised.

My one uneasiness lies in many comments that I have received with regard to concerns about diflubenzuron's impacts on non-target populations of lepidoptera and anthropods.

1 I was somewhat confused as to the intent of the language "There could be beneficial effects by reducing the impacts of gypsy moth", (p. II-26). Beneficial to snails, insects, and crestaceans? Beneficial enough to offset population reductions in these species?

Beyond this small concern I have no further comments on the E.I.S., and thank you for the opportunity to review it.

Sincerely,

John W. McCarthy
County Administrator

JWM:g

cc: gypsy moth file

Response to Comments in Letter No. 3

From: John W. McCarthy, County Administrator, County of Rappahannock, Washington, VA

Comment No.	Response
1.	When intervention tactics are available, the possibility exists for fewer impacts on habitats of insects, snails and crustaceans from gypsy moth. The summary language of effects of alternatives on insects, snails and crustaceans has been changed to clarify what was intended by the term, "beneficial effects". The wording for alternative 2 now states, ..."except in wilderness, reductions of effects of gypsy moth are possible." For alternative 3-6, (Table II-4) "Reductions of effects of gypsy moth are possible throughout project area in alternatives 4-6."
	The discussion of effects in the summary of Chapter II and elsewhere in the EIS present an unbiased list of known and probable effects. It would be premature to weigh the value of these and other effects in determining what is "best" for the AIPM Program. A comparison of effects (beneficial vs negative) will play a crucial role in selecting intervention tactics at the site-specific project level. Choices that weigh benefits against reductions of populations as you suggest are likely to surface at the project level. See Letter No. 4, response no. 1, Letter No. 23, response no. 13, Letter No. 25, response no. 4, Letter No. 45, response no. 2, and Letter No. 54, response no. 8 for some discussion on effects of some intervention tactics on some wildlife.

4

21 NOV 1988

Karl J. Grandstaff
117 McGovran Road
Charleston, W. Va. 25314

November 8, 1988

Mr. David P. Smith
AIPM EIS Team
Suite 718N 1720 Peachtree Rd.NW
Atlanta, Ga. 30367

Dear Mr. Smith,

In evaluating the impact statement relating to Gypsy Moth management I must state that I prefer the 2nd alternative instead of alternative number 5. I have received information that the chemical insecticide diflubenzuron has a much longer half-life than what is stated in this report. It would
1 therefore stay in the food chain longer and quite possibly be dangerous to the native trout population in the treated areas. Not only would more of the insect population be affected over a longer time than you reported; but the absence of these insects in the food chain could put stress on the fish and bird life of the area.

I do not mind biological treatment of both the wilderness and non-wilderness areas; it is just that chemical treatment should always be used as a last resort. If you do decide to
2 use chemical pesticides please monitor the impact after each application.

Thank you very much for keeping me informed of your plans for the Gypsy Moth Demonstration Project.

Respectfully yours,

Karl J. Grandstaff

Karl J. Grandstaff

Response to Comments in Letter No. 4

From: Karl J. Grandstaff

Comment No.	Response
1.	a. Persistence of diflubenzuron in the environment is determined largely by existing environmental conditions. Except in unusual circumstences, diflubenzuron is rapidly bound by soil or organic matter suspended in water. The half life of diflubenzuron is influenced by temperature, pH, microbial activity, amount of suspended organic material in water, the particle size of the active ingredient and the substrate (soil, water, litter, sediment or foliage). The discussion describing diflubenzuron as a tactic considered in the alternatives in Chapter II has been expanded to explain more comprehensively the fate of diflubenzuron.
	b. Diflubenzuron concentrations in water are not known to have adverse effects on any fish. Ingested diflubenzuron is quickly excreted by fish and does not "bio-accumulate" in body tissues (see discussion of effects of alternative 3 on fish and aquatic ecosystems in Chapter IV of FEIS). Investigations of effects of diflubenzuron were inconclusive in identifying any pathological significance on rainbow trout up to a rate of 10 ppm (100 times normal application rates); (Madder and Lockhart, 1978). See Letter No. 50, response no. 2 for discussion of native trout and the AIPM Program.
	A longer half life suggested in this comment does not directly correlate to continued suppression of insect populations (see Chapter IV, effects of implementing alternative 3 sections on Insects and, Fish and Aquatic Ecosystems). While some species of insects may be reduced for short periods of time and feeding patterns of some birds and fish shift to compensate, there is no evidence that growth rates or physical condition of individuals in fish or bird populations are significantly affected by application of diflubenzuron. The discussion in Chapter IV of effects of diflubenzuron on fish and aquatic ecosystems has been expanded to address this concern. In addition, a mitigating measure has been added to buffer trout streams from applications of diflubenzuron (Chapter II, Mitigation Measures).
2.	As indicated in Chapter I, this EIS is not site specific. Additional site-specific analysis and appropriate NEPA documentation will be conducted and tiered to this document. The site-specific analysis will be developed by the appropriate land-managing agency, based primarily upon gypsy moth population data, management objectives, on-site conditions, and public input. In general, the least impacting effective intervention tactic available in the selected alternative that is capable of achieving project objectives will be recommended. Appropriate mitigating measures have been developed for all alternatives that contain insecticide (NPV, Bt or diflubenzuron) intervention tactics. (See Chapter II, Mitigating Measures, pages II-32 - II-37 of the DEIS).

5

21 NOV 1988

Raymond Mills
Lavalette, W.Va.
Nov. 8, 1988

Dear Sirs;

After carefully reading the Draft Environmental Impact Statment, it is my openion that alternative 5 is most suited to apply to all my concerns. While
1 I still have concerns that some adverse affects may result from the application of Difubenzuron. It would have much less impact than the defoliation and tree mortality which could occur without its use.

Since man imported this pest, it is man's responsibility to try to controll its affects. I do not want my children and grandchildren to experience with the oak
2 what I have with the American Chestnut, therefore we must do something. Hopefully with Alternative 5 our wilderness areas can be sufficiently protected without Difubenzuron.

I appreciate the opportunity to read this material and give my comments.

There has been a typographical error in my
3 name on your list. It is Mills not Hills; but my mail has arrived anyway.

Thank You.
Raymond Mills
5273 Dunkle Br. Rd.
Lavalette, W.Va 25535

Response to Comments in Letter No. 5

From: Raymond Mills

Comment No.	Response
1.	As described in Chapter II, Alternatives, Including the Proposed Action, and Chapter IV, Environmental Consequences, there are impacts to the environment, from the "no action" alternative as well as all the "action" alternatives. The effect of diflubenzuron on the environment is discussed in Chapter IV (pages IV-22 - IV-26) and Appendix C of the DEIS. Additional site-specific analysis and appropriate NEPA documentation will be conducted to determine the intervention tactic(s) capable of achieving project objectives under the selected alternative. Mitigating Measures (pages II-32 - II-37), as outlined in Chapter II of the DEIS, should minimize adverse impacts associated with chemical intervention tactics. Additional criteria or requirements based on project site conditions will be incorporated into project work plans.
2.	Comment noted.
3.	Noted and corrected.

6

23 NOV 1988

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DAVID P. SMITH
USDA FOREST SERVICE, SOUTHERN REGION
1720 PEACHTREE RD., NW
ATLANTA, GA 30367

November 18, 1988

DEAR DAVID SMITH,

1 I WOULD LIKE TO RESPOND TO AIPM PROJECT FOR GYPSY MOTHS. I HAVE READ OVER THE MATERIAL AND AM IN FULL SUPPORT OF ALTERNATIVE 5 WHICH IS NOT TO INCLUDE CHEMICAL INSECTICIDES. THE REASONS WHICH I SEE ARE ADVERSE EFFECTS ON HUMANS AND OTHER SPECIES CAUSED BY CHEMICAL INTERVENTION AND THE NEED FOR NATURE TO BUILD A BALANCE WHICH CHEMICALS USUALLY DO NOT ALLOW. I AM VERY HAPPY THAT THE PROJECT IS ALLOWING EACH LAND MANAGEMENT TO DECIDE WHETHER TREATMENT IS NEEDED.

CORDIALLY,

CRAIG HALL

Response to Comments in Letter No. 6

From: Craig Hall, Strout Scenic Realty

Comment No.	Response
1.	Table II-2 of the FEIS illustrates the alternatives in tabular form. Alternatives 3-6 provide for the use of diflubenzuron, a chemical insecticide, in the general project area. However, this chemical will not be used in wilderness under alternatives 3-5.
	Before the responsible land manager can use any tactic including diflubenzuron, additional site-specific analysis and an appropriate NEPA document must be prepared. This site-specific document must examine the potential impacts on nontarget organisms as well as humans and weigh them against the anticipated benefits from treatment with diflubenzuron.
	Appendix C of the EIS presents a summary of the health risk analysis for diflubenzuron. Diflubenzuron is a insect growth regulator chemical which interferes with the synthesis of chitin, a substance found in the body wall of insects. Chitin synthesis does not occur in higher organisms such as mammals and man; therefore diflubenzuron has very low mammalian and nonmammalian toxicity exclusive of insects and some aquatic organisms.

7

25 NOV 1988

Route 1 Box 395
Raphine, Va., 24472
Nov. 21, 1988

Mr. David P. Smith G&P'n E&S Team
1720 Peachtree Road, N.W., Suite 718 N
Atlanta, Ga, 30367

Dear Mr. Smith:

As well as I have been able (with my glaucoma-cataract eyes) I have read and re-read your Draft Environmental Impact Statement, Appalachian Integrated Pest Management, Gypsy Moth Demonstration Project, received in late October.

I think I replied to an earlier communication on the subject, saying I did not consider myself qualified to express an opinion. I still feel the same way so again will refrain from rendering a detailed opinion. I will say, I have faith in the U S D A Forest Service and feel you will follow the wiser course. The methods that will do the most good with the least overall harm no doubt will be the ones chosen. I am aware that the degree of infestation of any given area will govern methods used.

On the subject of Wilderness I am at a crossroads. A few years back I

(response on next page)

7

Mrs. Smith ②

took an active part in the effort to get
wilderness areas established ~~in~~ Virginia and
West Virginia. Now I am asked "let it alone"
or include it in this gypsy moth control
problem? My feeling is that it would be
criminal and short sighted to do nothing to stop
1 this very destructive pest from devastating our
treasured woodlands. Some corrective measure
should be used for Wilderness areas too. ~~But~~, no
new roads, no chainsaws.

I am complimented to have been
included in this survey but regret to see the
Mrs. (which I feel sure I had used) has been
dropped and my late husband's name only is
2 being used (page VI-10). I receive your mail-
ings but it always grieves me to have this
happen.

Best wishes.

Sincerely,
Adeline B. Lyle
(Mrs. Charles G.)

Response to Comments in Letter No. 7

From: Adeline B. Lyle

Comment No.	Response
1.	The analysis in Chapter IV discloses that wilderness within the AIPM Project will be impacted under all alternatives. Part of the management objectives for these areas is to allow natural processes to occur and shape the ecosystem with minimal human interference. If intervention action occurs, the natural processes and wilderness integrity would be affected. On the other hand, if no action is taken, the gypsy moth, an exotic introduced insect, would likewise affect natural processes and wilderness integrity. As a result of the analysis in this EIS, input from the public and land managing agencies and current direction regarding wilderness management, there will normally be no action taken in wilderness to suppress the gypsy moth. Gypsy moth will be allowed to exist in the wilderness ecosystem and the wilderness ecosystem will be allowed to adapt to its presence. There are extenuating circumstances described in Chapter II of the FEIS (See Alternatives Considered in Detail section), under which treatment in wilderness would be considered. The type of intervention tactic chosen, if intervention is determined to be necessary, will depend upon a site-specific analysis and further NEPA documentation. The use of chain saws or the development of roads in wilderness will not occur under the AIPM Program.
2.	Comment noted and corrected.

01 DEC 1988

8

Coastal Lumber Company

— Appalachian Hardwoods —

Regional Office
P.O. BOX 979
BUCKHANNON, WV 26201
Telephone (304) 472-2841
Facsimile (304) 472-2388

November 28, 1988

David P. Smith, EIS Team Leader
USDA Forest Service, Southern Region
1720 Peachtree Road, NW
Atlanta, GA 30367

Mr. Smith,

I recently attended a public meeting in Elkins, West Virginia conducted by the Forest Service to discuss their AIPM on public lands through most of eastern West Virginia and northwestern Virginia.

1 I strongly feel that the US Forest Supervisors and other land managers must have the option to use any and all available, safe means of control measures for gypsy moth on lands under their care.

2 Alternative #6 is the absolute least that should be approved.

3 It would be absolute insanity to allow the gypsy moth to breed and use our public lands as a corridor to expand uninhibited on down the Appalachian Mountains.

I feel that the real sentiment of the public toward a "no action" scheme was seen in the fires on Yellowstone this summer.

4 Not only must the value of the public land be protected, but private lands will be exposed to a "gypsy moth sanctuary" if the public lands (including designated "wilderness") are not appropriately treated.

5 Although not discussed in the Alternatives, I also feel silvicultural treatments must be considered to prevent undesirable stand/species changes caused by gypsy moth defoliation.

6 Most importantly, the appropriate action - regardless of what it is, must be available to the land managers on a timely basis. The moth's schedule is not impeded by lengthy decision making processes and it has no political boundaries to honor. It is essential that effective control measures be taken as soon as the problem is discovered.

— Manufacturers of Quality Domestic, Export and Industrial Lumber —

Response to Comments in Letter No. 8

From: Robert M. Garrison, Division Timber Manager, Coastal Lumber Company

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	Comment noted.
4.	Depending on the alternative selected by the responsible official, if wilderness is not to be treated, adjacent public or private lands will be protected to the extent possible. Efforts will be made to confine damaging gypsy moth populations to the wilderness and to minimize defoliation and impacts on adjacent lands. Alternatives 4, 5 (preferred) and 6 allow for treatment to occur in wilderness to protect adjacent private lands from defoliation and possible tree mortality if these lands cannot be adequately protected by action outside wilderness.
5.	As discussed in the DEIS, page II-7, Forest Service research is currently working on the development of silvicultural prescriptions to minimize the impacts caused by the gypsy moth. Because the research is ongoing and results are not available, silvicultural techniques are not included in the alternatives at this time. In addition, this technique does nothing to reduce the rate of spread of the gypsy moth, an objective of the AIPM Project. Although silvicultural treatments will not be considered as an operational component of the AIPM Project, AIPM will support research and pilot evaluations of silvicultural treatments. Environmental analysis will be conducted prior to implementation of pilot studies.
6.	The initiation of various types of treatment will begin in 1989, if an action alternative is selected and as soon as the environmental assessments are approved by the appropriate responsible officials. Evaluations of egg mass data, site and forest information and public input will be done. Recommendations will be made to public and private land managers as to the appropriate action to manage gypsy moth populations on a particular site. The responsible land managers or owners will then decide if they want to participate in the Project, and if so, an intervention method will be selected from those recommended, to be applied to their particular area.

8

-2-

7 The protection of our public resources and potential threats to adjacent private lands and resources is too great for anything less than an "all out" effort to control this pest.

Sincerely,

Robert M. Garrison
Division Timber Manager

RMG/acw

7. Comment noted.

9

D. FRENCH SLAUGHTER, JR.
7TH DISTRICT, VIRGINIA

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SMALL BUSINESS

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318 CANNON HOUSE OFFICE BUILDING
TELEPHONE: (202) 225-6561

02 DEC 1988

Congress of the United States
House of Representatives
Washington, DC 20515

PLEASE REPLY TO:
OFFICES IN THE 7TH DISTRICT:

☐ 100 COURT SQUARE ANNEX
(P.O. BOX 136)
CHARLOTTESVILLE, VA 22902
TELEPHONE: (804) 295-2106

☐ 110 SOUTH WEST STREET
(P.O. BOX 1075)
CULPEPER, VA 22701
(703) 825-3495

☐ SUITE 203, 904 PRINCESS ANNE STREET
(P.O. BOX 336)
FREDERICKSBURG, VA 22404
TELEPHONE: (703) 373-0636

☐ 112 NORTH CAMERON STREET
(P.O. BOX 714)
WINCHESTER, VA 22601
TELEPHONE: (703) 667-0990

November 29, 1988

Mr. David P. Smith
Appalachian Integrated Pest
Management EIS Team
Suite 718N
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

Dear Mr. Smith:

It is my understanding that the Draft Environmental Impact Statement for the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project, which will be used to prepare the Final EIS, is open for public comment through December 12, 1988.

As you are aware, the counties of Albemarle, Greene, Madison, Page, Rappahannock, and Shenandoah included in the AIPM project area are located in the 7th Congressional District of Virginia which I am privileged to represent.

For the last several years I have worked with officials in the above counties and the National Park Service to promote better coordination of gypsy moth spraying programs. While the National Park Service in the Shenandoah National Park only conducts spraying in high density population areas such as picnic and camping grounds, the surrounding counties have conducted extensive spraying to ease the further infestation of gypsy moths in the area. Local officials in the counties of Warren, Greene, Madison, Page, and Shenandoah have indicated that untreated areas within the Park have allowed the gypsy moth to multiply and spread into the surrounding counties despite their abatement efforts.

1 While I am not in a position of expertise to comment upon the merits of the program alternatives contained within the Draft EIS, I would like to extend my support for development of a management program for gypsy moth infestation on Federal ~~and non-~~Federal lands within the AIPM demonstration area. I believe the expedient ~~development~~ of guidelines for future site-specific projects under the Appalachian Integrated Pest Management program, as required under the National Environmental Policy Act, is an important step toward the reduction of gypsy moth infestation and the resulting defoliation.

Thank you for your consideration of this important matter.

Sincerely,

D. French Slaughter, Jr.

DFS/ph

Response to Comments in Letter No. 9

From: D. French Slaughter, Jr.

Comment No.	Response
1.	We concur. Relevant information and analysis contained in this programmatic EIS can be incorporated by reference when future NEPA documentation is needed for site-specific projects to manage gypsy moth in the AIPM Project Area. The appropriate land-managing agencies will conduct a site-specific analysis before taking action at the project level. This EIS can be used for tiering when these site-specific NEPA documents are prepared.

10

0 5 DEC 1988

Thomas Oldham
235 Diamond St.
Elkins, W.V. 26241
1 Dec 1988

Dear Sirs,
Thankyou for a chance to respond to the AIPM
alternatives.
I have attended the hearing at Elkins and feel
I understand the alternatives fairly well.
I honestly feel that the AIPM project is a way
for Mr. Byrd to throw money at the GM problem
first to make the problem go away secondly to satisfy
his folks that he is doing something. GM are all
~~other~~ over the NE without life as we know it
coming to an end. I would hope that some where in
1 this AIPM monies are dedicated scientifically to fund
research of GM eradication.
I can understand that some treatment where GM
could be controlled with biological tactics should be
2 used. Also the spray (Dithiburzuron) should only be used
in high use areas (ie lakes, picnics areas, historical or
geophysical ones [Blackwater Falls]).
I feel also that as a whole wilderness areas should not
3 be interfered with. maybe some biological tactics but
definitely no sprays.
If using the spray as I mentioned around high
use areas is part of the General Management practices
4 than I am for Alt-2 with Alt. 4 to apply for
Wilderness areas to control low level infestations when it
adjoins the high use areas.

Sincerly yours.
Thomas E. Oldham

Response to Comments in Letter No. 10

From: Thomas Oldham

Comment No.	Response
1.	Congress, in the 1987 Supplemental Appropriations Bill, included funding for the development of the AIPM Project in Virginia and West Virginia. Funding was also provided for Forest Service research to support the project. In addition to Forest Service research, the AIPM Project is using some of the funding to support methods improvement projects aimed at improving existing suppression technology. A list of Forest Service research in support of the AIPM Project and AIPM-funded methods improvement projects is located in Appendix F of the EIS.
2.	Comment noted.
3.	Comment noted.
4.	Comment noted.

11

05 DEC 1988

Coastal Lumber Company

— Appalachian Hardwoods —

Regional Office
P.O. BOX 979
BUCKHANNON, WV 26201
Telephone (304) 472-2841

December 2, 1988

David P. Smith, EIS Team Leader
USDA Forest Service, Souther Region
1720 Peachtree Road, NW
Atlanta, Georgia 30367

Mr. Smith,

Until this past summer I had never seen the destruction in our hardwood forest's caused by Gypsy Moths. Even though I had heard accounts and read articles on the subject I was amazed. Hundreds of acres defoliated by the moths.

What a loss to everyone concerned. A valuable commercial resource providing jobs, a source of food and shelter for our wildlife species, a situation which has become aesthetically unpleasing.

1 I feel that alternative #6 of the Forest Service AIPM on public lands is the best option available to us.

Lets take care of people not moths.

Sincerely

Sid Clevenger
Logging Superintendant
Coastal Lumber Company
P.O. Box 218
Gassaway, WV 26624

— Manufacturers of Quality Domestic, Export and Industrial Lumber —

Response to Comments in Letter No. 11

From: Sid Clevenger, Coastal Lumber Company

Comment No.	Response
1.	Comment noted.

12

0 6 DEC 1988

Coastal Lumber Company

An Integrated Commitment to Manufacture, Process and Distribute Quality Hardwoods, Cypress and Pine

NORTHERN TREATING DIVISION:
P. O. DRAWER 1307
UNIONTOWN, PA 15401
(412) 430-3627

December 2, 1988

David P. Smith, EIS team Leader
USDA Forest Service, Southern Region
1720 Peachtree Road, NW
Atlanta, GA 30367

Mr. Smith:

I am writing to express my concerns about the Forest Service AIPM on public land through Southwestern Pennsylvania and Eastern West Virginia.

1 I think it is imperative that the U.S. Forest Service and other land managers must have the option to use any and all available and safe means of control measures for gypsy moth on lands under their care.

2 Alternative #6 is the absolute least that should be approved.

3 It would be blatant disregard of such a valuable natural resource to allow the gypsy moth to proceed unchecked down the Appalachian Mountains.

4 The clearcutting controversy in years past will look like "small potatoes" compared to the public outcry which could result from a "wait and see" plan of action!

5 Not only must the value of the public land be protected, but private lands will be exposed to a "gypsy moth sanctuary" if the public lands (including designated "wilderness") are not appropriately treated.

6 Although not discussed as alternatives, I also feel silvicultural treatments must be considered to prevent undesirable stand/specie changes caused by gypsy moth defoliation.

7 Most importantly, the appropriate action, regardless of what it is, must be available to the land managers on a timely basis. I am working in an area (Somerset County, PA), which unfortunately has had too little action too late. Salvage cutting hundreds of acres of dead oak is not wise silvicultural treatment, but hopefully we can learn from these areas and plan for the future. It is essential that effective control measures be taken as soon as possible.

8 Lastly, the protection of our public resources and potential threats to adjacent private lands and resources is too great for anything less than an "all out" effort to control this pest.

Sincerely,

Curtis R. Eshleman
Curtis R. Eshleman
Procurement Forester

Response to Comments in Letter No. 12

From: Curtis R. Eshleman, Procurement Forester, Coastal Lumber Company

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	Comment noted.
4.	Comment noted.
5.	Comment noted.
6.	See response to Letter No. 8, Comment 5 on silvicultural treatments.
7.	See response to Letter No. 8, Comment 6 on appropriate action in a timely manner.
8.	Comment noted.

13

0 6 DEC 1988

Ron Casto
5320 E. Pamela Circle
Cross Lanes, W. Va. 25313
December 3,1988

David P. Smith, AIPM EIS Team Leader
United States Department of Agriculture
Suite 951
1720 Peachtree Road,NW
Atlanta, Ga. 30367-9102

Dear Mr. Smith:

I have received the draft on the gypsy moth demonstration project.

This is a area that I feel the goverment is in a better position to make a decision.

I would like for you to address the position of clear cuts. Particularly the area in the Monogahela National Forest, Sherwood Lake area that has been clear-cut. It appears to me that a lot of wood products (firewood,etc.) has been left to go to waste. This vast area looks like what Mt. St. Helen would look like.

My concern is can this waste be used in a productive way. Rather than layed in waste.

1 If this does not fall within your realm, please pass it on.

Thank you.

Sincerely yours,

Ron Casto

Ron Casto

Response to Comments in Letter No. 13

From: Ron Casto

Comment No.	Response
1.	Comments are not applicable to the AIPM DEIS; letter referred to the Monongahela National Forest.

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08 DEC 1988

Dec 5, 1988
314 6th St
Rainelle WV 25962

David P. Smith
AIPH EIS Team
Suite 718 N
1720 Peachtree Rd. N.W.
Atlanta Georgia 30367

Dear Mr. Smith,

Alternative 5 Page II-22

1 I think the Wilderness area should be treated to stop the spread of the gypsy moth.

To cut down of the potential impact of the Lepidoptera species

2 Before spraying have another plane to fly ahead. They may be scared by the sound of the motor & fly to another area.

Yours truly,
Yvonne Wheeler
314 6th St
Rainelle WV 25962

Response to Comments in Letter No. 14

From: Yvonne Wheeler

Comment No.	Response
1.	Comment noted.
2.	Comment noted.

15

0 8 DEC 1988 **Friends of the Roanoke River**

December 5, 1988

David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

Dear Mr. Smith:

Some additional comments and questions on the Draft EIS for AIPM:

1) Page IV-11 states "There is a definite increase in water yield when watersheds are heavily defoliated. "...water production was increased by 146,000 gal./acre due to defoliation.

First of all, this contradicts Page IV-14, which states, "There would
1 be no effect to wetlands and flood plains." Clearly, there would be increased run-off and higher peak flows during floods. Is this not accurate?

Secondly, what percentage increase in run-off is 146,000 gal. per acre compared to the pre-defoliation run-off?

2) As a general comment, it seems that the alternative chosen is going to be applied to the entire area of AIPM. Would it not be better to apply
2 different alternatives to different areas of AIPM to measure the effectiveness of each?

3) As a general comment, while no economic cost benefit analysis is deemed
3 necessary, a cost benefit analysis would still be helpful, even if the benefits were less than costs.

4 4) In addition, it would be enormously helpful to know the economic and environmental damages inflicted on areas of past infestation.

A brief executive summary of economic impacts would allow citizens to better
5 evaluate the alternative of no action with other alternatives. If they are not known, we need to know that also.

P.O. Box 1750
Roanoke, Virginia 24008
Tel. (703) 343-3696

Response to Comments in Letter No. 15

From: William H. Tanger, III, Friends of the Roanoke River

Comment No.	Response
1.	In the Eastern United States, hardwood defoliation by the gypsy moth generally becomes visible in June and reaches maximum levels by mid-July, when most of the larvae stop feeding and pupate. Hardwoods that survive the defoliation begin to refoliate (produce new leaves) in late July and August. Therefore, the period of defoliation is relatively short and generally occurs during the dryer portions of the year. However, if heavy rains and flooding should occur during this period, then increased run-off and higher peak flows would be expected. The cited publication (Corbett and Lynch, 1987) does not provide predefoliation run-off data or normal annual water yield figures. Therefore we cannot determine what percentage increase in run-off or water yield that the 146,000 gallons per acre represents.
2.	Any alternative that is selected will be applicable to the entire AIPM Project Area. However, due to the variety of intervention tactics available under any alternative (with the exception of alternative 1, in which "no action" occurs in the AIPM Project), it is expected that site-specific analysis and further NEPA documentation will provide the opportunity for the use of various tactics in different areas and the resulting effectiveness of these treatments can be determined.
3.	AIPM is a demonstration project with the primary objectives of slowing the spread and reducing damage caused by gypsy moth defoliation irrespective of economic values. However, an economic accounting of the project will be conducted and financial records will be maintained by year, by land managing agency, and by type of activity. Site-specific analysis and further NEPA documentation will determine what type of intervention tactic will be selected and where it will be applied as well as other considerations (mitigating measures for T&E species, gypsy moth population levels, etc.). As such, it is impossible to determine all the relevant costs at this time as well as any benefits derived from such intervention tactics for an economic cost/benefit analysis.
4.	The environmental consequences of alternative 1 (no action), pages IV-3 - IV-16 of the DEIS are for the most part based on studies of areas infested with gypsy moth. For example, page IV-4 of the DEIS, 8th paragraph, Herrick and Gasner are cited regarding changes in forest condition as a result of gypsy moth defoliation. (See also page IV-5, 1st paragraph of the DEIS). Additional studies on gypsy moth impacts and economics such as Sharpe, page IV-9, 9th paragraph, Corbett and Lynch, page IV-11, 4th paragraph and Quimby, page IV-5, 2nd paragraph of the DEIS) on the environment are discussed in this alternative.
5.	Socio-economic effects under the no action alternative are presented on pages IV-13 and IV-14 of the DEIS. At this point in time, it is not possible to determine actual relevant costs or benefits as explained in Response 3 and 4.

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David P. Smith
December 5, 1988
Page Two

6 5) Also, it seems that better publicity needs to be given this problem. As a partner in an advertising agency, I can tell you that much could be done to give this issue much higher national visibility, or at least regional.

7 6) In general, I want to commend your approach to this problem, and your efforts to date. There is much to be done, obviously, and I hope the above suggestions may help.

Thank you,

William H. Tanger, III
Friends of the Roanoke River

William H. Tanger, III
Friends of the Roanoke River
P.O. Box 1750
Roanoke, VA 24008

6. We agree that additional publicity is needed. We now have a full time public affairs specialist who is in the process of developing a public involvement strategy.

   This strategy will involve local, Regional, and National media coverage as well as interaction with interest groups, opinion leaders and governments. Key to the strategy is the use of an "Information Team" which consists of information specialists from each of the cooperating agencies. Information in the form of press releases, memos, and printed material is distributed from the AIPM public affairs specialist to the information team, who in turn, redistribute it to their individual media sources and publics.

7. Comment noted.

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08 DEC 1988

ABATIS
SECURITY
OFFICER LOG

P & B
DEC - ? 1988

WAYN-TEX

Date: 12-4-88
Time of Report: 8:16 pm to

Security Officer — Printed Name: Sgt. Richard Hodge — Signature: Richard Hodge — Initials: R.H.

TIME	COMMENTS	INITIALS
8:16	The Environmental Impact Statement on the Gypsy Moth, is a well stated Project. It seems as there are pro's + con's in every alternative. It seem's like every winter gets a little milder to help them out that much more to expand. Just to observe the Moth gives it more opertunity to expand. Insecticides might get into small streams, bird + other mammals might eat infected insects.	
	If the same animals would happen to eat sterile male Moth's would they end up sterile too.	
	There pro's + con's to every tactic you have listed in the impact statement, but you can't set around and destroy our forests. I would use the tactics least harmfull to the environment and the ballance of nature and use it.	
	I like the way the Impact Statement is written. It sure gives you plenty of room to think + wonder.	
	I could go on all night long about the Impact Statement but it pretty well states its self. I sure appreciate being sent the Impact Statement to go over!	
	Sincerely, Richard Hodge	R.H.

Margin markers beside the letter: 1 (insecticides/streams passage), 2 (sterile male moths passage), 3 (tactics passage).

Response to Comments in Letter No. 16

From: Richard Hodge

Comment No.	Response
1.	Generally, birds and mammals will not eat insects that are dead or have been killed by an insecticide such as diflubenzuron (Dimilin). However, if they happen to eat dying insects, the diflubenzuron will be excreted without any effect on the mammal or birds. Only organisms that produce chitin will potentially be affected by the insecticide. Mammals, birds, fish, reptiles and humans do not produce chitin and are generally unaffected by diflubenzuron at rates applied to control the gypsy moths.
2.	Organisms that eat sterile male moths will not become sterile.
3.	Comment noted.

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28 DEC 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

December 19, 1988

Mr. David P. Smith
EIS Team Leader
USDA/FS, Southern Region
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

Dear Mr. Smith:

These comments are volunteered to the AIPM project as EPA's member of the planning committee. I have not received formal solicitation for comments through the normal channels of EPA. Although there is a great deal of interest in the management of the gypsy moth within the Office of Pesticide Programs, this talent has not been tapped except informally. My comments on the DEIS are:

1 • The overall quality of the DEIS is good and reflects a great deal of strategic thinking in its development. There are portions that are descriptive of other peripheral programs that may lead the reader to believe are to be included in the AIPM program; they should be deleted or better identified.

2 • There are several issues that are deferred to the site-specific environmental analysis that should be addressed by the DEIS. Of particular concern are the specific analysis criteria describing how site information wil be used to determine treatment options.

3 • The AIPM DEIS does not have a termination date. A date should be specified for the conclusion of the project, or at least a date for reevaluation of the

Response to Comments in Letter No. 17

From: William E. Currie (EPA)

Comment No.	Response
1.	Descriptions of USDA Forest Service cooperative gypsy moth suppression programs and APHIS Gypsy Moth regulatory and eradication programs have been expanded under the section entitled "Current Programs", page I-13 - 14, of the DEIS to explain how these programs differ from the AIPM Demonstration Project.
2.	Comment noted, see new language in Chapter II, Alternatives Considered In Detail.
3.	The AIPM Project, although originally anticipated as a 5-year effort, is funded annually and thus has no specified termination date. The various reports evaluating the relative success of the Project objectives will be prepared after the end of the Project. We anticipate that these will be available within three years after the Project is completed. This information has been added to Chapter I of the FEIS.

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thrust and scope of the project. Also some reports are implied in the DEIS to be available "at the conclusion of the project," without indicating when. A reasonable time for the remainder of the project to show some beneficial results, and develop some new and innovative, low impact, intervention methods should be in the range of 5 to 7 years (1993 - 1995).

4 • The definition of IPM on page VII-6 should be deleted and the following inserted. " Integrated Pest Management (IPM) is the coordinated use of pest and environmental information with available pest control methods to prevent unacceptable levels of pest damage by the most economical means, and with the least possible hazard to people, property and the environment. The goal of the IPM approach is to manage pests and the environment so as to balance costs, benefits, public health and environmental quality. IPM systems utilize a high quantity and quality of technical information on the pest and its interaction with the environment (site). Because IPM programs apply a holistic approach to pest management decision-making, they take advantage of <u>all</u> appropriate pest management options, including but not limited to pesticides."

5 • The definition of canopy on page VII-2 should be modified to indicate a cover of foliage. If only branches and twigs are considered without foliage coverage, any treatment will not be available to the target pest and may have adverse non-target effects. This is particularly true if the canopy covers water or streams.

6 • The definition for Diflubenzuron on page VII-3 should be modified to read; ... and prevents gypsy moth "or other chitin producing arthropods" from successfully completing their molting process.

7 • Throughout the DEIS is reference to a 200 ft. buffer zone to prevent spray particles from reaching sensitive sites such as water or streams and wilderness areas. If pesticidal material is aerially applied, experience on other sites suggest that a 1000 ft. buffer is more realistic to mitigate pesticide impact on sensitive sites. Perhaps if rotary-winged craft are used for aerial treatment a smaller buffer margin can be set.

• The chart on page I-10 and I-11 indicates that in spite of years of treatment, the cyclic nature of the gypsy

4. Comment noted. The Forest Service believes the IPM definition in the DEIS best fits the AIPM Program.

5. The target for application of an insecticide against gypsy moth is foliage. Application of insecticide does not begin until leaf expansion reaches an acceptable level (generally 30-50% leaf expansion). Interception of aerially applied insecticides includes interception on foliage and on twigs and branches. As such, canopy coverage includes all vegetative cover and not foliage alone. For this reason, the definition was not changed.

6. The definition has been changed to read: "....by interfering with chitin synthesis and prevents gypsy moth and some other immature chitin synthesizing insects and crustaceans from successfully completing their molting process."

7. See Letter No. 54, response no. 4.

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8 moth related to defoliation always comes back to a zero acres level. The population drop is attributed to natural causes such as weather or predators, paracites, or pathogens. All the treatment has not slowed the movement of the pest population. This table graphically shows why a low pesticide input IPM approach should be tried (because the chemical pesticides haven't, and probably won't, work to slow the spread of the gypsy moth.).

9 • On page II-7 in the 4th paragraph it is implied that Diflubenzuron, because it is detected on foliage up to 60 days (after treatment), is still effective. If it is effective after that time, say so. If not, indicate how long it is effective, especially for non-target organisms.

10 • On page II-2, at the bottom, the list of collected data looks comprehensive; however there is no indication of how these data are to be weighted, nor how they are to be used in the analysis to determine the intervention tactics to be selected for a specific site. A discussion of the process should be provided with some value scale for the various data to be used.

11 • The selection of alternative 5 as the preferred IPM tactic seems to ignore the definition of Wilderness on page VII-13 as "undeveloped Federal land retaining its primeval character without permanent improvements or human habitation...." The alternative treatments 4, 5, and 6 indicate "A continual need for human intervention in the control of gypsy moth will be required" As timber production is not to be considered for wilderness, and the natural pristine conditions maintained, natural succession from pressure by an exotic organism is part of the wilderness experience. Most users of the wilderness are aware of the impact of natural succession and the dynamic nature of the site under invading species pressure, and will accept the process, rather than be subjected to the unnatural pressure of treatment of the wilderness. The AIPM should reconsider the selection of Alternative 5 and opt for Alternative 3. In the selection of Alternative 3, strict criteria should be placed on the selection of any tactic that is not gypsy moth specific in nature. More emphasis should also

8. Past efforts under the current State/Federal cooperative suppression program were not designed to slow the spread of gypsy moths. The suppression program reacts to high gypsy moth populations that have the potential to defoliate and cause tree mortality. Under the AIPM Program, major emphasis has been placed on the monitoring system to provide data on gypsy moth populations. In an approach never before tried on an area of this size, an attempt will be made to manage gypsy moth and maintain populations at low levels to reduce adverse effects and slow the spread of gypsy moth.

9. Diflubenzuron has been detected on hardwood foliage for up to 60 days following treatment using standard chemical analysis procedures. To our knowledge, no bioassay has been conducted to determine: (a) if the residual diflubenzuron on treated foliage is active against gypsy moth or other nontarget, leaf-chewing insects, (b) whether the concentrations of diflubenzuron on foliage are sufficiently high to interrupt development of insects feeding on older, treated foliage. This issue has been identified as a research need in the DEIS (page IV-35, item 4). The paragraph describes the state-of-knowledge regarding this issue and was not changed.

10. How this information is used to help determine whether or not management of a particular infestation is needed depends on the site-specific conditions once an infestation is identified. The weight of the various components will vary considerably depending on the site. The various permutations possible when considering these factors over the 12.8-million acre AIPM Area would be considerable and not deemed appropriate for a programmatic EIS. Once an infestation and site have been identified, these factors will be used in the decision making and NEPA process at the site-specific level and will be made available to the public. See Letter No. 17, response no. 2.

11. As detailed in Chapter IV, the environmental impacts to the wilderness resource have been described in a factual and unbiased manner. Scoping letters used to develop issues for the EIS and responses to the EIS indicate mixed feelings on whether or not intervention should occur in wilderness. A decision on what alternative will be implemented will be contained in the Record of Decision by the responsible official and will contain the rationale for its selection.

The use of parasites and predacious insects as well as silvicultural techniques will be explored as indicated on pages II-6 and II-7 of the DEIS. However, as explained on pages II-9 and II-10 of the DEIS, these two techniques are limited in their ability to meet AIPM objectives. See also Letter No. 8, response no. 5.

be placed on use of appropriate silvicultural practices and the use of parasites and predators.

I hope these comments are useful to you and will improve the viability of the AIPM project to the long-term management of the gypsy moth.

Sincerely,

Bill

William E. Currie
Pest Management Specialist

cc: Allan Bullard,
Project Leader

18

0 9 DEC 1988

SIERRA CLUB

APPALACHIAN REGIONAL CONSERVATION COMMITTEE

53 College Avenue
Buckhannon, WV 26201
December 5, 1988

Mr. David Smith
Gypsy Moth AIPM EIS Team Leader
USDA Forest Service, Southern Region
1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Smith:

We are taking this opportunity to respond to the Draft Environmental Impact Statement for the Appalachian Integrated Pest Management Gypsy Moth Demonstration Project, dated October 1988. You and your staff are to be commended for having pulled together a good deal of information on rather short notice.

The comments in this letter are those of Sierra Club's Appalachian Regional Conservation Committee, a regional entity responsible for conservation policy for the Club in eight states (Virginia, West Virginia, South Carolina, North Carolina, Tennessee, Pennsylvania, Maryland, Deleware) and the District of Columbia. This Committee represents some 56,000 Sierra Club members. We are not making any attempt to mobilize our members to respond with individual letters to your office but are instead using this Committee as our representative body to express the Club's concerns.

1 I. Our greatest concern is that none of the alternatives, including your preferred one, provide criteria to be used for guidance by the local land managers as to the type of control method used. As it stands, alternative five permits essentially any approach (except some limitation on the types of chemical insecticides). For instance, the land manager may choose to use diflubenzuron in general project areas, Bt in Wilderness areas, and totally ignore the principles of integrated pest management.

2 As we all know, some approaches are best suited for light infestations of the moths and some are better for the situations when the moth populations are dense. However, there seems to be little recognition of this fact in the DEIS. Also, different types of land use in various areas of the AIPM should probably dictate somewhat different tactics. This is not addressed explicitly in the DEIS. While we recognize that detailed decision matrices could not be presented in this document, some general guidelines are needed for the different levels of intervention.

Response to Comments in Letter No. 18

From: Katharine B. Gregg, Sierra Club, Appalachian Regional Conservation Committee

Comment No.	Response
1.	Please refer to pages II-12 - 13 of the DEIS for a discussion of how the local site-specific analyses will be conducted to determine the appropriate actions in each situation. The purpose of this document is to describe an overall program and the process through which local land managers will determine specific actions to be taken. See Letter No. 55, Response No. 2.
2.	Pages II-4 through II-7 of the AIPM EIS presented a description of the various intervention tactics proposed for use in the Project. Each description contained an indication of the gypsy moth population level for which the tactic is normally used. In a few cases, this information has been modified based on input from the AIPM Technical Working Group. Additional information is presented on Page IV-7, paragraph 1-3; page IV-22, Alternative 3, paragraph 2 of the DEIS. However, it is recognized that all field conditions or exceptions cannot be anticipated. Therefore the site-specific documents that are based on current field data and related information will be used in making specific treatment recommendations to the responsible land managers or owners.

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II. Of the alternatives provided, we much prefer alternative three because we are opposed to any intervention in Wilderness areas. Assuming for the moment that a safe, effective, species-specific agent were available for use against
3 the gypsy moth, you would still have to choose an appropriate delivery system. Wilderness areas are by their nature remote, rugged, and difficult to access. Any incursion against the moths will require aircraft, vehicles, pack animals, and/or people on foot to transport the moth-killing substance to the front lines. Whichever one or combination of these methods is used, the Wilderness will be disturbed to some extent.

In addition to the environmental damage caused by delivery of a gypsy moth control agent, we face the problem of finding one which adversely affects only the targeted organism. Bt, while
4 being relatively benign, may also be harmful to moths and butterflies in general, and depending on the "inert" ingredients with which it is combined, potentially harmful to many other organisms as well. Gypcheck is currently in such low supply that its use will undoubtedly be severely limited.

We should remind ourselves that the northeastern United States still has forested lands despite more than a hundred years of gypsy moth occupation. Apparently, accomodation has occurred
5 there; the same should be possible here in West Virginia and Virginia. Yes, the character of the forest may change, but this is neither the first nor the last time that will happen. By leaving Wilderness areas alone, they can serve as control plots permitting an evaluation of how well natural processes cope with the gypsy moth.

III. The front cover of the DEIS states that AIPM is a demonstration project. As such, a prime purpose should be methods development, especially since control of gypsy moth in southern hardwood forests is not well understood. We are
6 concerned that local political considerations may override the need for controlled tests of the various moth management tactics and thereby greatly weaken the value of this whole project. People need to realize that this project's objectives are, in addition to killing bugs, the development of methods for doing so with the least environmental harm.

IV. Nowhere in the DEIS is there any indication of how large the "site specific areas" will be (a county, group of
7 counties of similar character, a National Forest, forest district, or what?). We are concerned that the public not be inundated with a multitude of separate Environmental Assessments.

3. As discussed in Chapter IV, wilderness will be disturbed when any intervention tactic is applied.

4. Of the intervention tactics presented in this AIPM Project, disparlure, inherited sterility, mass trapping, sterile moths and nucleopolyhedrosis virus (NPV) are known only to affect gypsy moths (see Intervention Tactics described in Chapter I).

There are different varieties and strains of Bacillus thuringiensis (Bt) available by use against forest and agricultural Lepidoptera. Two strains are being proposed for use in this AIPM Project: Bt Berliner, variety Kurstaki strain HD-1 and Kurstaki strain NRD-12 (see description of intervention tactics considered in alternatives section in Chapter II). Not all moths and butterflies are sensitive to these strains of Bt. See Letter No. 24, response no. 3 and Letter No. 23, response nos. 12 and 13 for additional information on Bt effects on some butterflies and moths. Some nontarget Lepidopterous insects may be impacted by Bt if they are actively feeding in the treated area within 14 days after application.

Current formulations of Bt proposed for use in this Project are not known to contain "inert" ingredients that are potentially harmful to other organisms (see Appendix D, Biological Pesticide Bioburden).

5. As explained on page I-3 of the DEIS, most of the Shenandoah National Park land is zoned wilderness or natural and will serve as comparison areas. Wilderness managed by the Forest Service may be treated depending upon the alternative selected by the responsible official in the Record of Decision if specific conditions occur as described under the Description of Alternatives in Chapter II. If an action alternative is selected, further site-specific analysis will determine the need for action and appropriate NEPA documentation will be prepared before intervention occurs. Also on page II-13 of the DEIS, it is discussed that direction is lacking on whether to treat an exotic insect such as gypsy moth in wilderness. On pages II-13 and II-14 of the DEIS, criteria or special procedures for infestations in wilderness are detailed.

6. The entire AIPM Project effort in 1988 was devoted to preparation of NEPA documentation, survey and monitoring, and methods improvement evaluation. The major portion of the AIPM effort in 1989 is devoted to survey and monitoring, controlled methods improvement studies and pilot projects of intervention activities to manage low density populations. We do not anticipate that "killing bugs" will override "management of low density populations" as an AIPM objective.

Appendix F lists methods development projects that were initiated with AIPM Project funds in 1988 and planned projects for 1989. Considerable methods improvement work has been scheduled in the AIPM Project Area during 1989. The monitoring system and funding has afforded the opportunity to look at various methods of managing gypsy moth, especially at low levels, which is one of the primary strategies associated with AIPM.

7. See Letter No. 55, Response No. 2 for a discussion on further NEPA documentation.

Each major land manager has the authority and responsibility for making decisions on the lands under his jurisdiction. Therefore, there will be up to seven site-specific analyses occurring for any given year--one for each National Forest, one for each of two National Parks and one for each state. Each analysis will consider actions on all lands under the jurisdiction of that manager.

18

V. The scoping process for the site specific assessments will be an important matter for the public and for Sierra Club. This can be greatly aided by your making available, before any public meetings, some concisely written information on control
8 options, effects on non-target organisms, a brief overview of gypsy moth biology, and an explanation of why this project is not an elimination program. People need to be able to obtain this material easily and quickly. Having it readily available will greatly help to set and maintain a high level of discussion. It will also help to avoid raising both false fears and hopes.

VI. While we are not opposed to the use of diflubenzuron under limited circumstancs, we are opposed to its widespread use over large areas. As the DEIS is written, it is possible (dare we say probable?) for diflubenzuron to be very widely used even
9 to the exclusion of the more specific control methods. We feel strongly that the emphasis in any control program should be on biological methods because of their more benign effects on the environment and the reduced likelihood that the moths will develop resistance to them. Because this is a demonstration project, there is an excellent opportunity here to perfect these methods, which we all agree are preferable to the use of chemical insecticides.

We appreciate this opportunity to comment on this DEIS and we urge you to incorporate these concerns into the final EIS. Thank you for your consideration of our views.

Sincerely,

Katharine B. Gregg

Katharine B. Gregg, Chair, Sierra Club
Appalachian Regional Conservation Committee

cc: Alan Heath, Mary Wimmer, Jim Pierce,
Mike Iwanik, Dick Reardon, Joy Oakes

8. There is an Information Team associated with this Project. Their responsibility is to develop and disseminate information covering all aspects of the Project to the public. The documents you describe are currently in preparation and will be provided as available.

9. The AIPM Project is recommending the most efficacious material with the least potential environmental impact for use within the AIPM Project area. The AIPM Project will be conducting numerous methods improvement studies in 1989 and beyond in an effort to perfect these biological methods.

19

03 JAN 1989

DEC 20 1988

Dec. 11, 1988

~~Director~~
Programs
Methods
Coordination
Pesticides
R-9 Pest Coord.
Clerical
MFO
SPFO
DFO
File

1950 (GMEIS)
USDA Forest Service
370 Reed Rd
Broomall, PA. 19008

Dear Sir:

I am writing concerning the DEIS for the Appalachian Integrated Pest Management Gypsy Moth Demonstration Project.

I am most concerned about the impacts of the several alternatives on human health and non-target organisms. Those intervention tactics such as Disparlure, Inherited Sterility measures and NPV and Bt are all ecologically sound measures even though Bt
1 does effect other Lepidoptera insects. These measures would probably not affect the balance of nature in the targeted forest area to any significant extent. Mass trapping is a naturally safe procedure
2 but I wonder how effective it really is in reducing a population, especially since only male moths are trapped.

Response to Comments in Letter No. 19

From: Dorothy Bliss

Comment No.	Response
1.	Comment noted.
2.	The Animal & Plant Health Inspection Service (APHIS) has successfully used the mass trapping technique by itself or in combination with a Bt application to eradicate low level gypsy moth populations. Currently, data is not available to show that this technique is effective when used alone or in combination with other intervention tactics within the generally infested area or at the leading edge. The AIPM Project is designed to answer this question.

5/1/82

19

The introduction of parasites and predacious insects must be tightly controlled
3 to prevent the escape of an organism that might cause severe disruption of other insect populations.

I am most concerned about the use of diflubenzuron which may pose some hazards to humans, especially if misused in
4 greater than normal concentrations or in repeated applications. On page C-9 it is brought out that this chemical may impair the blood-stream's ability to carry oxygen. On C-10 it is mentioned that a breakdown product 4-chloroaniline is produced and that this has the potential of causing cancer. I realize that the experimental data support the probability that diflubenzuron is safe in concentrations generally used but its effect in the environment may be different from that in laboratory experiments.

Since the Gypsy Moth is a foreign invader of our southern forests it is..

3. Before any introduction of an imported insect is made, it is thoroughly evaluated to insure that it will not adversely affect native beneficial insects. None of the parasites or predators released over the last 75 years for the control of gypsy moth have had any adverse impacts on our native insects. See also Letter No. 28, response no. 2.

4. The risk analysis in Appendix C took into account the possibility of greater concentration of insecticide by evaluating a dose of .06 pounds active ingredient vs the .03 pounds used in normal suppression projects. In addition, the risk analysis evaluated repeated (7) applications at this higher rate. The risk analysis also used unrealistically high levels of exposure for both indirect contact and dietary. The analysis shows that all exposures are below the ADI. The ADI for diflubenzuron came from tests that determined the no observable effect level for the formation of methemoglobinia, which impairs the blood's ability to carry oxygen. This rate was then reduced 100 times for safety.

Diflubenzuron is broken down into various metabolites which are further broken down and so on until they are excreted from the body. The metabolite 4-chloroaniline is a secondary metabolite which is quickly broken down further in the body. The risk to humans would result if 4-chloroaniline were to be ingested rather than diflubenzuron. The risk of acquiring cancer from exposure to this metabolite through the application of diflubenzuron resulted in a cancer risk of greater than 1 to 10 billion.

The experimental data is from carefully controlled studies that do not allow environmental interactions that dilute exposure or allow for breakdown of diflubenzuron. Laboratory tests will therefore result in higher levels of exposure than what would occur in the environment.

Bliss-3

19

logical and necessary procedure to try to control its spread. Wilderness areas in the East are extremely small and could be devastated by a high population of these moths and although in most cases

5 it is preferable to let nature take its course, however, in this instance intervention by the methods indicated in my first # seem warranted.

Alternatives 4 and 5 seem to me to be the most practical and effective procedures to follow although knowing the

6 past history of ineffective intervention in eastern United States it is doubtful that any method or methods employed will prevent much of the devastation that appears to be inevitable.

I thank you for the opportunity to respond to this draft Environmental Impact Statement. Please keep me informed of progress in these matters.

Sincerely,

Dorothy C Bliss

DOROTHY BLISS
322 SUMPTER ST
LYNCHBURG VA 24503

5. The effects of gypsy moth upon the wilderness resource have been described in Chapter IV, Environmental Consequences. As indicated on page II-13 of the DEIS, direction is lacking on whether to manage gypsy moth in wilderness. The EIS only discloses the elements and factual results of the analysis of the AIPM Program. The decision on whether to treat wilderness under AIPM will be made by the responsible official in the Record of Decision. If an action alternative is selected, further site-specific analysis and NEPA documentation is necessary before action occurs. If a decision to treat wilderness is made, the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives will be recommended.

6. Comment noted.

20

12 DEC 1988

Staunton Va
Rt. 1. Box 157
12-7-88.

Dear Mr. Smith;

Please note that I am in full agreement with the statements in the document I received on the Draft E.I.S,
1 Concerning the Appalachian Integrated Pest management, Program.

It is Certain these things must be done, to controle or try to - distructive elements in our forest's. They will get to private woodland soon We in the private sector must learn from your records what works best before we can dare do anything on our own level.

The private sector working with the various government agencies is the only way we can ever solve problems like these that effect all our quality of life.

I am a Garden Club member and we have had several programs on these pests & given by the local 4-H. groups & one by local forrestry personal. you must know these clubs are very dedicated to all phases of environmental & wildlife management programs.

Hope this is what you are looking for in an answer to your letter.

Sincerely
Mrs Katherine R. Fix.

Response to Comments in Letter No. 20

From: Katherine R. Fix

Comment No.	Response
1.	Comment noted.

1 2 DEC 1988

TENNESSEE VALLEY AUTHORITY
KNOXVILLE, TENNESSEE 37902

21

DEC 0 7 1988

Mr. David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road, NW.
Atlanta, Georgia 30367

Dear Mr. Smith:

Thank you for the opportunity for the Tennessee Valley Authority (TVA) to comment on the Draft Environmental Impact Statement (DEIS) for the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project. Although the DEIS focuses on the Appalachian region, TVA has an interest in this project because of its applicability across the Tennessee Valley.

TVA is very aware that the gypsy moth is a serious threat to the forests in the Appalachian and the Tennessee Valley regions. Consequently, TVA fully supports the stated objectives of the AIPM project. Research and management information gained through the AIPM project will help in dealing with this insect pest when it invades the highly susceptible oak forests which are predominant in the Tennessee Valley.

TVA and the United States Forest Service (Service) have had a long working relationship in forest pest management and, consequently, we have a strong interest in the subject project and the associated DEIS. During early planning for gypsy moth incursions into the Tennessee Valley, TVA and the Service entered into an agreement on March 8, 1984, ". . . to cooperate fully in the planning and coordination of activities designed to prevent or suppress outbreaks of damaging forest insects and diseases on lands administered by TVA with an emphasis on integrated pest management approaches." In furtherance of this cooperative approach, TVA notified the Environmental Protection Agency on August 9, 1984, that it was adopting the Service's final environmental impact statement on gypsy moth suppression and eradication projects. Annual detection and trapping of gypsy moths on TVA lands are jointly planned and coordinated by TVA and the Service.

1 TVA also supports the preferred project alternative (alternative 5) with the condition that, to the extent practicable, use of diflubenzuron should be minimized. We encourage more testing of chemical and biological control methods that are specific to gypsy moth and less harmful to other forest fauna. In wilderness areas, the use of _Bacillus thuringiensis_ should be accompanied by studies of its impact on native Lepidoptera, particularly those sensitive species within the project area.

An Equal Opportunity Employer

Response to Comments in Letter No. 21

From: M. Paul Schmierbach, Environmental Quality, Tennessee Valley Authority

Comment No.	Response
1.	Additional research studies and methods development work is under way or planned as part of the AIPM Project (see Appendix F that has been added to the Final EIS). The impact of _Bacillus thuringiensis_ on nontarget native Lepidoptera, especially sensitive species, was indicated as a research needed item on page IV-35 of the DEIS. Forest Service research has been requested to fund and conduct such studies by the AIPM Project Manager.

21

Mr. David P. Smith

DEC 07 1988

Should there be any questions, please have your staff call Dale V. Wilhelm at (615) 632-6693 in Knoxville, Tennessee. TVA looks forward to a continuation of cooperative relationships on this and other issues.

Sincerely,

M. Paul Schmierbach

M. Paul Schmierbach, Manager
Environmental Quality

22

12 DEC 1988

November 22, 1988

Mr. Dan Herron
Chairman
SAF Skyline Chapter

Dear Mr.Herron:

1 The Policy Legislative Committee of our SAF chapter has been requested to review the Forest Service proposed gypsy moth control project (Appalachian integrated pest management) on approximately 12.8 million acres covering certain counties of Virginia and West Virginia and to recommend to them what position our chapter should take on the Forest Service preferred alternative.

After reviewing all six alternatives in detail, it is the recommendation of this committee to adopt the preferred alternative which states "AIPM program would be implemented, management of gypsy moth populations within the general project area could occur using tactics that only affect gypsy moth, other biological tactics, or with the chemical insecticide diflbenzuron. In wilderness, monitoring would occur and if necessary tactics that only affect gypsy moth and biological tactics (includes Bt) could be used"

Respectfully submitted,

John A. Heard

John A. Heard
Policy/Legislative Committee member

Dear Mr. Smith

Our chapter approved this recommendation on December 6, 1988.

Cordially yours

Dan Herron

DAN HERRON
SKYLINE CHAPTER CHAIRMAN

Response to Comments in Letter No. 22

From: Dan Herron, Chairman, Society of American Foresters, Skyline Chapter

Comment No.	Response
1.	Comment noted.

23

12 DEC 1988

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
CUSTOM HOUSE, ROOM 217
SECOND AND CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106-2904

December 9, 1988

ER-88/964

Mr. David P. Smith, EIS Team Leader
U.S. Forest Service, Southern Region
1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Smith:

The following are the Department of the Interior comments on the Draft Environmental Impact Statement on the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project. We believe that the Forest Service has adequately addressed the key issues and impacts of the proposed project so we offer the following comments to clarify and refine various discussions in the document. As requested in the EIS distribution letter, we have referenced the specific page numbers to which our comments relate.

GENERAL COMMENTS

1 Where appropriate, we recommend that the Forest Service discuss ongoing gypsy moth research being conducted by the staff of Shenandoah National Park (with the assistance of Forest Service funding). The Park staff has initiated numerous monitoring and research projects to gather information on gypsy moth-caused defoliation. These projects are examining the effects of defoliation on black bears, hard mast production, forest composition, water quality, aquatic ecosystem dynamics, and recreational use. The Park has preliminary data on some of these subjects.

2 Another topic we recommend to be addressed in this EIS relates to the voluntary participation aspect of the proposed project. It is conceivable that the level of participation could have a substantial effect on the project's success. The Forest Service should state its best estimate of the level of participation necessary to produce valid results.

SPECIFIC COMMENTS

1. Page iv, paragraph 3; page I-2, paragraph 4; page I-3, paragraph 1; page II-14, paragraph 2

3 Please add the following: "A section of the Appalachian National Scenic Trail between Jarman Gap and Rockfish Gap (approximately 1,500 acres) is included in the AIPM Demonstration Project and will participate in the project in the same manner as Shenandoah National Park and Blue Ridge Parkway."

Response to Comments in Letter No. 23

From: Anita J. Miller, USDI, Office of Environmental Review

Comment No.	Response
1.	Several studies which focus on gypsy moth and gypsy moth infestations are being conducted on the Shenandoah National Park. Park staff are involved in monitoring gypsy moth patterns and gypsy moth induced tree mortality. A list of research projects being conducted in support of the AIPM Project can be found in Appendix F. The language pertaining to the Shenandoah National Park in the "Scope of the EIS" (Chapt I) and "Alternatives Considered in Detail" (Chapt II) have been expanded.
2.	There is no estimate of the level of participation necessary to produce valid results in this project. Project participation is and must be voluntary. It is anticipated that certain individuals, groups, towns and other administrative units will not participate even though they are offered the opportunity. Project success will be determined by comparing impacts and historic rates of spread in areas to the north of the project area (where participation in State and Federal/State cooperative suppression programs is also voluntary) with those in treated areas within this project. We also will be able to compare these same parameters with the situation that occurs on the Shenandoah National Park and on the Blue Ridge Parkway (see page I-3 of DEIS).
3.	Additional text added.

23

2. Page I-2, paragraph 4 and Page III-11 Recreation

4 Please add to both sections the following: "The Appalachian National Scenic Trail is a resource of national significance and traverses the AIPM Demonstration Project from north to south."

3. Page I-6 Life Cycle and Biology

5 We recommend that the EIS include a statement indicating that wind dispersal of early instar gypsy moth larvae frequently occurs before leaves have expanded sufficiently to permit the application of pesticides. This aspect of gypsy moth biology influences both the rate of spread of the gypsy moth and our ability to reduce the rate of spread through various intervention techniques.

4. Page II-2, paragraph 3

6 The EIS indicates that monitoring data such as percent of viable eggs per mass and percent of eggs parasitized will be used to help determine if and what types of intervention tactics may be employed. We support this approach, but recommend that the EIS should describe how this information will be used to make decisions. The threshold levels that will be used to trigger various intervention tactics should also be published in the EIS. These thresholds will be useful to the various participants of the AIPM in developing site- specific environmental analyses and selecting the appropriate intervention tactic.

5. Page II-5 Diflubenzuron

7 We suggest changing the sentence beginning "When ingested by lepidopterous insects . . ." to "When ingested by immature arthropods, such as gypsy moth larvae . . . ." As currently written this sentence implies that only lepidopterans are affected by this pesticide.

6. Page II-7, last paragraph

8 We recommend that this paragraph be expanded to provide a more thorough discussion on the operational effectiveness of both Dimilin and Bacillus thuringiensis (Bt). We note from Table I-1 that Delaware has only experienced gypsy moth defoliation since 1980 and that since then only 29,762 acres have been defoliated. We recommend that data comparing the effectiveness of Dimilin and Bt from states that have been managing gypsy moths for a longer period and over a greater variety of conditions should be used. At a minimum, we suggest that ranges of effectiveness of these pesticides should be listed. Data concerning the effectiveness of these treatments should come from scientific studies published in peer-reviewed journals.

The 1987 and 1988 Delaware Department of Agriculture publications referenced on page II-7 should be added to the References chapter of the EIS.

7. Page II-37 Sensitive Species

9 We suggest modifying the first sentence in number 7 to read "For applications of diflubenzuron, all water bodies will have a buffer zone of 200 feet." This will provide the most easily understood guidance to protect aquatic organisms.

4. Additional text added.

5. Comment noted. This section of the EIS adequately describes the larval dispersal process as a component of the lifestyle and biology of gypsy moth. The suggested changes introduce topics (application of pesticides, reducing rate of spread) better suited for another section of the EIS.

6. The decision to intervene and suppress a gypsy moth population is based on several biological data. One factor is percent egg viability. The decision to forego treatment may be made due to low egg viability and the decision to consider treatment may be made due to high egg viability. Thresholds have not been established and would be subject to change as warranted by new information. Such thresholds would be presented in the annual Program of Work.

7. We have changed the sentence to read: When ingested by gypsy moth larvae, diflubenzuron interferes with chitin synthesis and causes ..... A discussion of the nontarget effects on other insects is presented in the following paragraphs on page II-6 of the DEIS.

8. Several issues were raised concerning the appropriateness of a comparison between diflubenzuron and Bt. Due to differences in objectives, spray block sizes, foliage development, population densities, etc., comparisons between these two products based on data from operational suppression programs is not appropriate (in addition see Letter No. 38, response no. 2). As a result, the paragraph was deleted from the EIS.

9. The requested change in wording of the EIS was not accepted because: (a) The original wording reiterates the precautionary statements printed on the diflubenzuron label regarding application over water; (b) The proposed wording would suggest that any body of water, including perennial or intermittent streams with complete canopy coverage or even puddles of water, would require a buffer strip of Bt. Jones and Kochenderfer (1987) and Huber and Manchester (1988) indicate that the impact of diflubenzuron application on aquatic organisms in streams with a complete canopy cover is minimal; (c) Further restrictions on the application of diflubenzuron over bodies of water would be considered in site-specific analyses of proposed treatment areas; (d) An additional mitigation measure has been added to buffer trout waters in the AIPM Area (Chapter II, Mitigation Measures).

23

10 We suggest modifying item 8 to include posting of all undeveloped recreation areas that will receive aerial application of intervention tactics. Many of these areas have multiple points of access, including the Appalachian National Scenic Trail that transits the AIPM Demonstration Project.

8. Page III-12, paragraph 7

11 Please change " 'Natural Area' zone" to "Natural Zone."

9. Page IV-19, Table IV-1

12 This table should be expanded to include all the species known to be affected by applications of Bt. Providing a complete list of affected species will assist preparers of site-specific analyses in determining potential impacts of various intervention tactics.

10. Page IV-19, paragraph 2

13 The meaning of the statement "more individual moths" is unclear. If this implies that there are more moths of any one species post application, then Bt applications could be affecting the species diversity or other ecological interactions in a given area. As written, this paragraph implies that Bt is having a beneficial effect on native moths in treated areas.

11. Page IV-35, Identified Research Need Number 5

14 We are concerned that the language used in this item may be misinterpreted to mean that susceptible threatened and endangered species would become an experimental population for treatment tests. The Forest Service should make it clear that through the Section 7 consultation process, the Fish and Wildlife Service would decide which data are needed and under what circumstances treatments that could affect these species would be allowed.

SUMMARY

15 We recommend the selection of Alternate 4, which would allow the use of gypsy moth specific, biological, and diflubenzuron treatments in the General Project Area yet limit treatment in the wilderness area to the use of gypsy moth specific measures. The gypsy moth specific treatments of this alternative would not adversely impact the native species of the wilderness ecosystem.

Thank you for the opportunity to comment on this project.

Sincerely,

Anita J. Miller

Anita J. Miller
Regional Environmental Officer

3

10. Mitigating measure number 8 directly deals with wilderness. It is not appropriate to include undeveloped recreation areas in this mitigating measure. However, an additional mitigating measure has been added concerning the signing of trails. (See Mitigating Measure No. 10 in Chapter II of the FEIS).

11. Change made.

12. There are many varieties and strains of Bt. Two strains of Bt (Bt Berliner, variety Kurstaki strain HD-1 and Kurstaki strain NRD-12) are currently available for use in the AIPM Program.

A complete list of Lepidoptera species that could occur in the AIPM Project area and may be adversely affected by applications of the HD-1 and NRD-12 strains does not exist (identified in part as one of our research needs in Chapter IV). In addition, such a list prepared at the program level would be general in content due to a lack of specific information on project applications. i.e., timing, number of treatments, weather conditions, Lepidoptera species present. The most appropriate planning level to identify such a list is at the project (site specific) level.

There are some references that list Lepidoptera species which are susceptible to the HD-1 and NRD-12 strains. Table IV-1 has been expanded to include more Lepidoptera species affected by Bt. How Bt works is described in Chapter II under intervention tactics considered in alternatives. Some effects are described under alternative 2 effects on insects in Chapter IV. For more discussion on effects of Bt see response no. 13, and Letter No. 24, response no. 3.

13. Results of the survey conducted in Illinois indicated that the combined total moth population of all species present were greater in Bt treated areas. A large number of moths collected had to be classified as unknowns, but populations of 8 species of moths were monitored individually. *Apanehesis phalerata*, *Cissys falvicollis*, *Halisidota tessellaris*, *Heterocampa* spp., *Hypopripia fucosa*, *Nadata gibbosa* and *Malacosoma disstria* populations in treated areas followed similar population trends as occurred in control areas. Numbers of individuals of these species during most of the post treatment survey period (June-July) in Bt treated areas exceeded populations in control areas. *Datana* spp in Bt treated areas followed a similar population trend as occurred in control areas and were slightly lower in numbers of individuals during the latter part of the survey period (June 29-July 13).

The language on effects of Bt on insects has been changed to better describe the results of the survey in Illinois.

14. Identifying a need for more or better information about responses of endangered or threatened species to applications of Bt or diflubenzuron creates an environment for investigation. The type of investigation, what form investigations take and what information is collected will be determined by agencies responsible for administering endangered and threatened species resources. The US Fish & Wildlife Service is recognized as the lead agency in administering populations of Federally endangered or threatened species and will be the final authority on treatments or investigations involving those species.

15. Comment noted.

24

12 DEC 1988

SIERRA CLUB
WEST VIRGINIA CHAPTER
P. O. Box 4142
Morgantown, WV 26504

December 8, 1988

At a meeting of its Executive Committee on December 3, 1988, the West Virginia Chapter of the Sierra Club adopted the following policy concerning the Appalachian Integrated Pest Management demonstration project.

1 1. Dimilin use is to be restricted to site specific areas on a case by case basis when other alternatives have failed to prevent excessive population increases. There must be a clear justification for use of Dimilin. Because of the extreme sensitivity of aquatic organisms to Dimilin and the unknown effects of large scale, long term Dimilin treatment, there must be adequate buffer zones to protect aquatic life.

2 2. Bt is recommended for residential use to protect specimen trees and for suburban application. Bt will be applied a maximum of twice in a year.

3 3. Bt is not to be used in large scale forest applications. The potential consequences for other lepidoptera species are too great.

4 4. NPV use is endorsed without reservation for treatment of all areas to be treated for gypsy moths. If present supplies are limited, then the primary focus of funding is to be directed toward rapid expansion of capacity for production of NPV.

5 5. Decisions regarding the gypsy moth should be made rationally, avoiding an atmosphere of hysteria and undue intrusion of political influences, which can act to the detriment of reaching sound environmental decisions.

"Not blind opposition to progress, but opposition to blind progress."

Response to Comments in Letter No. 24

From: Sierra Club, WV Chapter

Comment No.	Response
1.	Comment noted. Additional environmental analysis and NEPA documentation are needed to narrow the proposed actions at the site-specific project level. In general, it is desirable to use the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives. As indicated on pages II-35 - 37, of the DEIS, Mitigating Measures 1, 2, 3 and 7, steps have been developed to adequately protect aquatic life from the effects of diflubenzuron in the AIPM Project Area.
2.	Comment noted.
3.	Only larval stages of butterflies and moths that are actively feeding on exposed leaf surfaces at the time of application and up to 14 days following application are susceptible to the Bt formulation proposed for use in the AIPM program. See Letter No. 23, response nos. 12 and 13 for discussions of effects of Bt on some Lepidoptera species.
4.	Gypchek is normally recommended for use against gypsy moth populations greater than 250 EM/A although methods improvement studies will be conducted in 1989 to determine its efficacy at lower population densities. Gypchek is produced by infecting and processing gypsy moth larvae which is expensive and extremely difficult. An alternate and more practical method of production is using tissue culture which is on-line but at this time too expensive for large-scale production.
5.	Comment noted.

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Mr. Smith, 12 DEC 1988 · 12/9/88

To begin with, please accept for yourself and your associates my compliments on your DEIS for the AIPM plan. I found it comprehensive, thorough, well structured and sequential and most importantly, easily assimilated by one with only a B.S. in biology. You seem to have made an effort to insure that the interested lay reader would understand the situation and the issues associated with it. Many thanks for that effort.

As to the DEIS itself, I must confess to some surprise at the fact that the USFS (which for decades I have derisively referred to as the U.S. Timber Service) has proposed a plan for gypsy moth control which shows an enlightened sensitivity to our forest lands and their biota as opposed to your usual view of them as a public resource to be held for the future use and profit (at taxpayer expense) of private timber companies who are heavy PAC contributors.

Of the 6 proposed alternatives I prefer No.4 to your choice of No.5.
1 I say this because No.4 would employ only g/m specific controls in
wilderness areas and I have an innate dislike for tampering with
wilderness areas unless absolutely necessary to their survival — and
then only in the most specific way and to the most minimal degree
necessary to solve the problem in question. With the general
2 project areas to receive options B, C + D tactics, I'd just as soon
keep treatment for the wilderness areas to option B to the
heaviest extent possible without significant damage from foot
traffic. You can always add option C and as a last resort,
option D if No.4 does not prove sufficiently effective.
3 Alternatives 1, 2 + 3 are unacceptable because they do nothing to
protect wilderness areas. Option A is insane. Forget it.
Option D has me worried. I read appendix C. I'm not concerned with
risks to human health. Your mitigating measures incorporating buffer
zones, attention to wind drift and rain, and your agreement of "extreme
caution" in the use of DIMLIN are reassuring but even with its very
4 short half-life (I LIKE THAT), I still worry about its immediate
effect on non-target insects, because of that, on insectivores
and most worrisome, the effects on rare mussels + crustacea
populations (reproductive capacities, genetic damage, etc.) which the
DEIS admits is a matter of guesswork. Stay away from DIMLIN
if at all possible + keep me posted. Good luck & thanks.

Allen Kreger
412 Pembroke Ave.
Norfolk, Va. 23507

Allen Kreger
412 Pembroke Avenue
Norfolk, Virginia 23507

Response to Comments in Letter No. 25

From: Allen Kreger

Comment No.	Response
1.	Comment noted.
2.	An alternative will be selected by the responsible official in the Record of Decision. The type of intervention tactic allowed under the selected alternative to be used in wilderness will depend upon a site-specific analysis and further NEPA documentation. The application of ground intervention tactics in wilderness does present the potential for adverse impacts to the wilderness resource from foot traffic as outlined in the EIS. (See discussion of potential impacts to wilderness from each alternative in Chapter IV of the FEIS).
3.	Comment noted.
4.	a. We are concerned about impacts of the gypsy moth and all non-gypsy moth specific tactics on nontarget organisms also (see identified research needs in Chapter IV) with particular interest to endangered and threatened species. Diflubenzuron only affects some organisms that produce chitin. Where these organisms are found and how they eat determine the degree and duration of effects of diflubenzuron on individuals or populations. Information on insects which may be affected by diflubenzuron appears in Chapter II (diflubenzuron-toxicology) and in Chapter IV (Alternative 3, Insects) of the EIS. Population fluctuations of nontarget insects which may result from applications of diflubenzuron are generally short in duration (less than one season). Threats to survival of a species could only be expected after repeated treatments at high rates over a short time (same year) none of which are proposed application methods for the AIPM Project. In the absence (or reduced supply) of these insects, animals (bats, birds, small mammals, amphibians and fish) shift to other available food sources. No animal is known, however, to selectively feed only on insects affected by diflubenzuron. b. Several studies have looked specifically at effects of Active Ingredient (A.I.) concentrations of diflubenzuron on population levels, reproductive capability (fecundity) and post treatment generation response of crustaceans in a variety of situations. Results of those studies have been added to the FEIS to better describe what is known about the effects of diflubenzuron on crustaceans (Chapter IV, alternative 3, Effects on Fish and Aquatic Ecosystems). The authors of the EIS could find no reliable information indicating adverse effects of diflubenzuron on mussels.

26

1 2 DEC 1988

Coastal Lumber Company

Pioneer Division

Producing Quality Appalachian Furniture Dimension and Bandsawn Lumber

December 6, 1988

DAILEY, WEST VIRGINIA 26259
P. O. BOX 156
TELEPHONE 338-4315
AREA CODE 304

David P. Smith, EIS Team Leader
USDA Forest Service, Southern Region
1720 Peachtree Road, NW
Atlante, GA 30367

Dear Mr. Smith,

1 I feel that US Forest Supervisors and other land managers must have the option to use all safe means of control for gypsy moth on public lands.

2 Alternative number six is the first step in this battle, it should be approved.

3 We must not allow the gypsy moth to breed and expand down the Appalachian Mountains. Not only must the public land be protected, but private lands will be exposed to a "gypsy sanctuary" if the public lands, including designated wilderness are not treated.

4 Last, whatever action that is to be taken must come quickly. The spread of this infestation will not wait on meetings and discussions. It is imparative that action be taken as soon as a problem is discovered.

Thank you,

Anthony C. Burgin
Anthony C. Burgin
Woodland Superintendent
Appalachian Division

DIMENSION MILL • DRY KILNS • BAND MILL

ALL PRICES, AGREEMENTS AND CONTRACTS ARE CONTINGENT UPON STRIKES, ACCIDENTS, DELAYS OF CARRIERS AND OTHER DELAYS UNAVOIDABLE OR BEYOND OUR CONTROL

Response to Comments in Letter No. 26

From: Anthony C. Burgin, Woodland Superintendent, Coastal Lumber Company

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	See response to Letter No. 8, comment no. 4 on the protection of adjacent public or private lands.
4.	See response to Letter No. 8, comment no. 6 on appropriate action in a timely manner.

27

12 DEC 1988

COLLEGE OF ARTS AND SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061-0406

DEPARTMENT OF BIOLOGY (703) 961-6407

December 8, 1988

Mr. David Smith, EIS Team Leader
USDA Forest Service, Southern Region
1720 Peachtree Rd, N.W.
Atlanta, GA 30367

Dear Mr. Smith:

I am writing to comment on the draft environmental impact stagement for the Appalachian Integrated Pest Management Gypsy Moth Demonstration Project, dated October, 1988. I have read nearly the entire document as I have an interest in the topic both from a professional and citizen standpoint.

1 My chief concern has to do with the toxicity of diflubenzuron to non-target organisms. The studies that are cited on page II-6 seem to be of rather limited scope and are, for the most part, not published in the peer-reviewed literature. It may well be that diflubenzuron is relatively harmless to non-target organisms, but the evidence presented is pretty inconclusive. Therefore, I urge it be used only in limited areas of high moth densities or where there is especially valuable vegetation that needs preserving.

2 My second concern has to do with the way the alternatives are stated, especially the preferred one. Alternative five permits essentially any approach that the local land managers wish to use (except the use of "hard" insecticides). There really ought to be some guidance as there may be strong political pressure to use diflubenzuron to the exclusion of the more specific measures. I would much prefer to see a strong emphasis on biological control methods. This is a demonstration project so there is a marvelous opportunity to test these to better understand their strengths and limitations in controlling gypsy moths in southern hardwood forests.

You and your staff have put together a very useful document which can, with a few relatively minor changes, guide the attempts at slowing the southern spread of the gypsy moth (which I am afraid will always be with us).

Sincerely,

Alan G. Heath

Alan G. Heath
Associate Professor

Response to Comments in Letter No. 27

From: Alan G. Heath, VPI & SU

Comment No.	Response
1.	The summary discussion on toxicology of diflubenzuron that appears in Chapter II references a final environmental impact statement (FEIS, 1985) and a paper prepared by Willcox and Coffey (1978). Both documents are in themselves a summary of the existing literature on the subject in 1985 and 1978 respectively. Publications that carried articles summarized by the 1985 FEIS and Willcox and Coffey include: Mosquito News, Journal of Insect Physiology, Insect Biochemistry and Life Science. The AIPM EIS is again a collective summary of existing information that is available to the authors in 1989. More attention and details about effects of diflubenzuron can be found in Chapter IV under effects of implementing alternative 3. For more discussion on some effects of diflubenzuron on nontarget organisms, see Letter No. 4, response no. 1b, and Letter No. 25, response no. 4. A decision to apply diflubenzuron will result in part by an analysis of gypsy moth population levels and the value of resources being protected as you suggest. See Letter No. 55, Response No. 2.
2.	The EIS presents a range of alternatives that permit different tactics to be used on different types of lands throughout the general AIPM area. Once an alternative is selected, the management options permitted under that alternative will be available to the various land managers to consider as the biological situation warrants. Before any tactics can be implemented, each land manager must conduct a site-specific analysis tiered to this document as described in Alternatives Considered in Detail on pages II-12 - II-13 of the DEIS. The site-specific analysis procedure provides for public participation in the analysis and decision-making process at the local, affected level. As described on page II-13 of the DEIS, the site-specific analysis conducted by each land manager will include development of a range of implementable alternatives that will achieve the goals of AIPM, but the final decision on the specific tactic to be implemented in each situation is the responsibility of the appropriate land manager.

28

12 DEC 1988

County of Roanoke

DEPARTMENT OF DEVELOPMENT

P.O. Box 29800
Roanoke, VA 24018-0798

PLANNING COMMISSION
BOARD OF ZONING APPEALS

December 9, 1988

Mr. David P. Smith
AIPM EIS Team, Suite 718N
1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Smith:

In response to your letter of October 25, 1988, Roanoke County
1 agrees with Forest Services' choice of alternative 5 as an appropriate level of management in the AIPM project area. However, Roanoke County cannot support the use of intervention tactic #7, the use of parasites and predaceous insects. The
2 possible ramifications of using this technique can never truly be determined, and its use should be discouraged.

Sincerely,

Edward M. DeTrude, Jr.

Edward M. DeTrude, Jr.
Planning Technician

ajb

Response to Comments in Letter No. 28

From: Edward M. DeTrude, Planning Technician, County of Roanoke

Comment No.	Response
1.	Comment noted.
2.	Control of numerous exotic agricultural pests have been achieved through the introduction of exotic parasites and predators. However, we must admit that similar introductions for controlling the gypsy moth have not been very successful. While the many introduced insects do not prevent gypsy moth populations from building to defoliating levels, they do constantly take their toll on the gypsy moth. Their impact on endemic or low level gypsy moth populations is especially important as one component in keeping populations at low levels. Since one of the goals of the AIPM Project is to demonstrate methods or techniques of keeping gypsy moth populations from building to high levels, we feel it is important to include the use of parasites and predators as components of our integrated pest management program. Only parasites and predators that: (a) are established, or (b) are native, or (c) are approved for release by the Agricultural Research Service (ARS) will be considered as an intervention tactic in the AIPM Program. Table II-1 in Chapter II displays the current list of parasites that could be released during the AIPM Project.

29

1 2 DEC 1988

328 Graham St
Elkins, WV 26241
Dec. 8. 1988

Dear Sir:

1 I am in favor of spraying where ever you must to control the gypsy moth.

In Randolph Co. W. Va, our future depends on the hardwoods of our area.

I know that your judgment of when and where to spray has been worked out in your meetings; because the protection of our forests all over the world, has a definite effect on global climate.

I feel forest management should be left to experts.

Sincerely,
Kathleen E. Straw

Response to Comments in Letter No. 29

From: Kathleen E. Straw

Comment No.	Response
1.	Comment noted.

30

12 DEC 1988

Dear People,

After reading through the Draft EIS
1 I feel that alternative #2 is the most
appropriate. That there is a Gypsy moth problem
shows that things in nature are a little out
2 of balance. Using chemicals in a effort
to regain the delicate balance of ~~nature~~
would in the long run be counter productive.
Possibly ~~even~~ throwing something else out
of kilter. People are going to clamor for
something to be done however, and in
3 light of this I feel that the more "natural"
tone of alternative #2 would be an
appropriate compromise.

Thank you for listening
Scott Ziemer

Scott Ziemer
RT. 1 BOX 200
Amissville, VA.
22002

Response to Comments in Letter No. 30

From: Scott Ziemer

Comment No.	Response
1.	Comment noted.
2.	The AIPM Program is designed to use a number of intervention tactics tailored to appropriate population levels. The only chemical insecticide that will be considered is diflubenzuron. A discussion on its impacts on the environment can be found in in the DEIS, pages II-5 and 6 and IV-22 thru 27. For the most part, diflubenzuron will only be used on high populations. Other tactics, some of which are host specific to the gypsy moth, will be used for lower populations. Intensive monitoring of gypsy moth population will allow the land manager to select a tactic that will keep populations low, and thereby reduce the need for chemical insecticides.
3.	Comment noted.

31

DEC 1988

13 DEC 1988

MARWOOD SR. APT. 4
BENWOOD, WV. 26031
9 December, 1988

DAVID P. SMITH
AIPM ELS TEAM, SUITE 718N
1720 PEACHTREE Rd., NW
ATLANTA, GA. 30367

Dear Sir;

My original input to your office was a query (in reply to a Local Newspaper item on THE AIPM) AS to how I could be of practical use in doing something to help eradicate the Gypsy moth. This was many months ago.

I was surprised to be a recipient of the DEIS!! I had neglected to inform you that I Live in MARSHALL COUNTY, W. VA., (the so-called NORTHERN Panhandle portion of WVA) which, To my knowledge is not not infested By the Gypsy moth. But I wanted to know how to recognize Gypsy moth incursions and to find out what I, (as a private individual tho without any forested property) could do to destroy eggs, Larvae etc. of the moth on my own Time & expense as Long as it was not too costly & within my financial means.

Any way I try to read the DEIS but I wind up with a headache from the reading of it. (I didn't graduate Hi Skool!!! But, I digress.) Rendon

(response on next page)

31

I recommend or approve of the following INTERVENTION TACTICS, to wit;

1 Pg iii of DEIS
1. DISPARLURE
2. INHERITED STERILITY
3. MASS TRAPPING
4. NPV,

used alone or in various combinations, because they seem to be effective & yet have the least impact on the environment & its inhabitants, plants, animals & insects.

2 From my reading of the DEIS these programs will be implemented only by members of the Forest Service. (?) Why can't private individuals, groups & organizations be included in the implementation, say, trapping & the like. I'd like to participate if I could obtain the proper materials & the know-how of how to use them even if it meant paying for the materials providing I could afford them, of course!!

Any way, I sure do hope ~~we~~ you can stop the spread of this infestation or at least get it under control.

HAPPY, HEALTHFUL DAYS AHEAD TO YOU AND YOURS;

Sincerely,

John S. Kosticky

JOHN S. KOSTICKY

Response to Comments in Letter No. 31

From: John Kosticky

Comment No.	Response
1.	Comment noted.
2.	As indicated on page I-2, 4th paragraph of the DEIS, all lands within the project area are eligible for intervention tactics without cost to the landowner. Participation in the Project is voluntary. If an individual, group or organization owns property within the AIPM Project Area, and elects to participate in the program, qualified AIPM personnel will oversee or implement the intervention tactic at no cost to the landowner.

32

14 DEC 1988

HOUSE OF DELEGATES
WEST VIRGINIA LEGISLATURE
STATE CAPITOL — PHONE (304) 340-3200
CHARLESTON 25305

TOM SUSMAN
BOX 757
SOPHIA, WV 25921
PHONE (304) 683-4860

December 7, 1988

David P. Smith
USDA
1720 Peachtree Road, N.W.
Atlanta, GA 30367

Re: 1950 (GMEIS)

Dear Mr. Smith:

1 The spraying for Gypsy moth in our state is of the utmost importance. The environmental impact of not spraying is comparable to a holocaust within nature.

As you know, West Virginia is a poor state and I hope your agency would shoulder more of the cost in spraying to eliminate this pest.

Again, it is imperative that spraying continue, and any further help you could be in securing federal dollars would be most welcomed.

Sincerely yours,

Delegate Tom Susman

TS:sah

Response to Comments in Letter No. 32

From: Tom Susman, House of Delegates, WV Legislature

Comment No.	Response
1.	Comment noted. All lands within the AIPM Project Area are eligible to participate in the AIPM Program including suppression treatments at no cost to the landowner. (See page I-2 of the DEIS).

33

DEC 1988

1011 Fairway Drive
Waynesboro, VA 22980
December 9, 1988

Mr. David P. Smith
AIPM EIS
Suite 718 N
1720 Peachtree Road NW
Atlanta, GA 30367

Dear Mr. Smith:

Below are our comments on the gypsy moth program, but first, here is our interest in its success. We have for over thirty years owned property in the Blue Ridge. It contains 325 acres and has as one boundary the Blue Ridge Parkway, between the 17 and 18-mile posts, and has National Forest as most of its other boundaries. It is used only for recreation. About five acres are kept open. The rest is wooded, with oak along the ridges and mixed growth in the hollows.

We would like the property to be included in your program as if it were National Forest land.

1 1.We cannot make an informed comment on the treatment or non-treatment of wilderness areas because we are not familiar with all the political and emotional restraints.

2 2.With no opinion on wilderness treatment alternatives 3,4,5, and 6 are acceptable.

3 3. We hope that you can from this program learn to fit the intervention agents to the density of moth population, aiming at some acceptable mortality rate. We much prefer the biological approach to the chemical and would accept a higher tree mortality if chemicals were not used.

4 4. We strongly favor continuing research to find parasites and predators that can in the long run bring the moth population into equilibrium.

Yours truly,

R.W. Nebel

C.K. Nebel

C.K. Nebel

Response to Comments in Letter No. 33

From: R. W. Nebel

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	AIPM includes a significant amount of methods improvement work to identify opportunities to effectively use tactics or combination of tactics in managing the various population levels of gypsy moth in the AIPM Project Area.
4.	Comment noted.

34

1 5 DEC 1988

Route 1, Box 331
Fulks Run, VA 22830

December 10, 1988

Mr. David Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road NW
Atlanta, GA 30367

Dear Mr. Smith:

I am writing in response to the DEIS for the Appalachian Integrated Gypsy Moth Demonstration Project. I appreciate the work that went into compiling such an exhaustive account of the moth and possibilities for its treatment.

1 I am opposed to the fundamental concept of AIPM. I believe that it is a mistake to begin intervention tactics in general forest areas that will require continuation forever simply to retain the present oak component. Inevitably, such tactics will be discontinued somewhere, sometime, and the insect will respond accordingly; in the meantime, environmental changes induced by the intervention tactics will occur for nothing. I favor only a strategy that aims at reducing the intensity and duration of initial moth attacks by insuring that natural controls--i.e., nucleopolyhedrosis virus, and parasites and predators of all kinds--are present and active as moth populations build up. I would also support national forest research into and demonstrations of silvicultural techniques, including selection and regeneration of good mast species and improvement of small mammal habitat, that look to the forest's future when the moth becomes naturalized here.

2 I strongly oppose use of Dimilin anywhere.

3 I oppose use of any intervention tactics in federally designated Wildernesses.

4 Considering that there are some areas, such as campgrounds, that for practical reasons will probably need treatment, I could support Alternative number 2 only.

Thank you for the opportunity to express my views.

Sincerely,

Chris Bolgiano

Christina Bolgiano

Response to Comments in Letter No. 34

From: Christina Bolgiano

Comment No.	Response
1.	As indicated on page I-6, item 6 of the DEIS, the Congress of the United States directed the USDA Forest Service to develop an integrated pest management project aimed at slowing the spread and minimizing the adverse effects of the gypsy moth. Apparently the Congress was not satisfied with the current gypsy moth suppression program which provides for treatment of high gypsy moth populations to prevent hardwood defoliation and mortality, with little effect on spread of the gypsy moth. The AIPM Project, however will employ intervention techniques in areas having low gypsy moth populations to prevent population build-up and spread of the insect. In areas where these techniques fail to prevent population build-up, other intervention methods, such as NPV, Bt or Dimilin could be utilized if they are included in the alternative selected by the responsible Forest Service official.
2.	Comment noted.
3.	Comment noted.
4.	Comment noted.

35

1 5 DEC 1988

MEDICAL EDITORS
Betsy T. White
Post Office Box 1258
Lynchburg, VA 24505
(804) 384-0333
13 December 1988

David P. Smith, AIPM EIS Team Leader
Suite 718N
1720 Peachtree Road NW
Atlanta, GA 30367

Dear Mr. Smith:

1 I am glad to have an opportunity to offer my opinion and state my desires as to the Gypsy Moth Project. Thank you for keeping me informed and asking for a response. In the letter you wrote me in October, you stated public meetings were to be held in Virginia during November, and that you would let me know about such meetings. I never received any such notice. Can you explain?

It's obvious from the summary document you sent me that your people have looked at this matter in great detail and with the fullest possible consideration of all alternatives. We know already that the gypsy moth is moving into areas of Amherst County that will affect our holdings there, so the problem is a real one.

2 Of the six alternatives proposed in the document, I would give consent for only Alternative 2, described on page II-15. I believe that gypsy-moth specific and biological tactics are the only ones we can be sure will not bring some future environmental nightmare down upon us. Therefore, if the "votes" of individuals count in any way in this matter, please put me on record as being in favor of Alternative 2 only and categorically opposed to use of any chemical insecticide such as diflubenzuron. My criterion is whether I would want the method used on my own land, and Alternative 2 is the only one that meets that criterion.

3 In the unhappy event that one of Alternatives 3-6 should be selected for implementation, I urge you to sponsor meetings of interested local groups and individuals in order that we may take all possible measures to protect ourselves and our property against the application of noxious chemicals in the surrounding areas.

Yours very truly,

Betsy T. White

Betsy T. White (Mrs.)

Response to Comments in Letter No. 35

From: Betsy T. White

Comment No.	Response
1.	A series of public meetings were held beginning at VPI on 11/5/88 and through the week of 11/14-11/17/88 in both Virginia and West Virginia. Public Affairs Specialists from AIPM headquarters in Morgantown, WV as well as from the Monongahela, Jefferson and George Washington National Forests helped coordinate these public meetings. These specialists contacted parties that they knew who were interested in AIPM as well as placing newspaper articles in local papers advertising these meetings. It was not the intentions of the EIS Team to contact everyone on the EIS mailing list (Chapter VI) as to when and where these meetings were to be held.
2.	Comment noted.
3.	Agreed. As required by NEPA, further site-specific analysis will be forthcoming before action is taken at the project level. Letter No. 15, comment no. 6 details further public affairs activities.
	Mitigating measures as outlined on pages II-35 - II-37 of the DEIS are aimed at minimizing human exposure and environmental impacts from insecticide applications. Additional mitigation measures will be developed in the site-specific NEPA documents that are applicable to the site and intervention technique proposed.
	Participation in the AIPM Program is voluntary. Permission from the landowner or land manager is required before any action is taken on that land. If a landowner who objects to treatment is adjacent to a land to be treated, a buffer zone will be established adjacent to and around the nontreated area.

1 5 DEC 1988

36

December 12, 1988

Gentlemen;

1 I have read your material on controlling the gypsy moth. After having done so I am leaning toward alternative 5, but there is one thing that bothers me - it is the effect it has on mayflies and other aquatic insects.

2 Our wild trout are losing ground fast, and I feel that alternative 5 would cause more hardships for our already declining wild trout. If the forests around the trout waters could be exempt I would favor alternative 5.

3 I realize that heavily infested forests around trout streams could cause damage to our wild trout, but I feel that the use of insecticides would cause more damage. Therefore, I believe that alternative 2 would be the best choice.

Sincerely,

Gene Johnson

Gene Johnson
Route 1 Box 189A
Letart, WV 25253

Response to Comments in Letter No. 36

From: Gene Johnson

Comment No.	Response
1.	See Letter No. 25, response no. 4 for a discussion of effects of diflubenzuron on aquatic insects.
2.	Streams and water bodies without canopy cover will not be treated with diflubenzuron. See Mitigating Measures, Chapter II, number 7. See Letter No. 4, response no. 1b and Letter No. 50, response no. 2 for a discussion on some effects on trout.
3.	The health and vigor of trout populations indicate the quality of the habitat where trout are found. Water quality (which includes levels of insecticides) is most likely the greatest influence on habitat quality for trout. Levels of Bt and diflubenzuron expected to occur as a result of AIPM treatments are not known to have any adverse effects on trout or other fish. See Letter No. 50, response no. 2 for a discussion on wild trout.

15 DEC 1988

12/13/88

37

David P. Smith
AIPM EIS TEAM
Suite 718 N
1720 Peachtree Rd NW
Atlanta, GA 30367

Dave:
Here are my comments on the Draft EIS.

1 To me, the primary concern should be the silvicultural or silvical impact of the gypsy moth on the oak forest. This aspect has been given a "back of the hand" effort. I think you can and should do a better job. All the other impacts pale beside the potential catastrophe of replacement of the oaks with other tree species. There are many silviculturists capable of doing an in-depth discussion. Pennsylvania has suffered defoliation of similar forest types with similar soil and water conditions. Conclusions can be drawn from that experience. Bring the

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Response to Comments in Letter No. 37

From: Robert G. Brooks

Comment No.	Response
1.	In the preparation of the AIPM Draft EIS, impacts that could be expected from implementation of the various alternatives are presented in an unbiased manner. In discussing the impact of the gypsy moth on vegetation, pages IV-4 and IV-5 of the DEIS, we selected two recent publications from the many that were available. The Herrick and Gansner (1988) study presented losses from randomly selected stands, located on various sites, having mixed hardwood species and subjected to varying intensities of defoliation. It was felt that this study presented the type of impacts that could be expected over a large area, such as a National Forest. Admittedly, this does not present the worst case picture that may occur on selected highly susceptible sites. In addressing the worst case situation, we selected the study reported by Quimby (1987), based on data from Pennsylvania. Additional studies that presented timber impacts from highly susceptible areas could have been presented.

37

MAJOR CONSIDERATION OUT IN FRONT RATHER THAN BURYING IT AMONG ALL THE OBLIGATORY LESSER CONSIDERATION.

2 AS THE CONTROL EFFORT GOES FORWARD A GREAT DEAL OF POTENTIALLY USEFUL INFORMATION SHOULD BE AVAILABLE FOR COLLECTION. MAYBE THE EIS ISN'T THE PLACE TO OUTLINE OPERATIONAL PLANS BUT WHO WILL BE RESPONSIBLE FOR MONITORING? I DON'T FEEL COMFORTABLE WITH THE ASSIGNMENT OF RESPONSIBILITY.

ROBERT G. BROOKS
940 SOUTH DOGWOOD
HARRISONBURG, VA 22801

2. Operational plans for carrying out the specific intervention actions will be developed for each action to be taken. These plans will specify the data to be collected to monitor the action and the individual/agency responsible for this monitoring. AIPM personnel and responsible land manager will coordinate to utilize monitoring results so treatment can be modified as necessary to ensure effectiveness and minimal impacts to the environment and improve overall operations. See "Alternatives Considered in Detail" Section for additional information that has been added.

38

15 DEC 1988

Rt. 1, Box 257
Greenwood, Virginia 229[illegible]
12-4-88

Mr. David P. Smith
AIPM, EIS Team
Suite 718 N
1720 Peachtree Rd., NW
Atlanta, GA 30367

Dear Mr. Smith:

Thanks very much for the opportunity to comment on the Draft Environmental Impact Statement, Appalachian Integrated Pest Management, Gypsy Moth Demonstration Project.

I found the draft EIS to be very informative with a great deal of useful information. I was still left with some questions; however, I believe that perhaps the information needed to answer these questions was beyond
1 the scope of the EIS. I would be interested to know the projected costs of each of the proposed alternatives.

In addition, I would like to have seen more information
2 on results of prior gypsy moth control programs. I did find some of this information on page II-7, but I would
3 like to have seen more assessment of the success of previous treatment programs. Is my impression correct that the proposed Appalachian IPM program is a much more "large-scale" attempt at gypsy moth control than any prior project?

The data on pages I-10 and I-11 summarizing gypsy moth defoliation on a state-by-state basis was very interesting; moreover, the entire section on population biology of the gypsy moth, especially the description of the outbreak cycles on I-11 and I-12, was very well written and useful.

Your letter of November 30th asked that I provide you with reasons for my comments. One reason I am commenting is because my family owns a tract of

---

Response to Comments in Letter No. 38

From: Brian G. Scruby

Comment No.	Response

1. The total cost of the various alternatives would depend upon the cost of the intervention tactics in each alternative and the acreage treated by intervention tactic. The cost of any tactic depends on a variety of factors, including the type of aircraft contracted, competitive bidding, size and complexity of the treatment area, the cost of the product, and the number of applications required. The following intervention costs are rough estimates, based on historic information. An estimated cost of $6.00 per acre is included in those tactics that require aerial application. The chart below shows rough estimates of tactic cost per acre. Some of the tactic costs are not known since they are still in the developmental stage.

TACTIC	APPROXIMATE COST/ACRE	COMMENT
Gypchek	$32.00	2 applications
Disparlure Flakes	$30.00	
Disparlure Tape	$40.00	ground applied
Sterile Eggs	unknown	ground or aerially applied
Sterile Moth	unknown	ground applied
Intensive Trapping	$22.00	ground applied
Bt (16 BIU/acre)	$12.00	1 application
	$24.00	2 applications
Dimilin	$10.00	1 application

As explained on page I-3 of the DEIS, an economic accounting of the Project will be conducted. Financial records will be maintained by year, group or agency and by type of activity. At the conclusion of the project, it will be possible to determine the absolute cost of all project activities.

2. We have removed the information cited on II-7 of the DEIS from the Delaware Department of Agriculture comparing the effectiveness of Dimilin and Bt because reviewers felt it presented an unfair comparison of the two insecticides. We have included additional information in Chapter II of the FEIS under the Comparison of Diflubenzuron, Bt, NPV Effectiveness section.

3. The Project Area includes all or portions of 38 counties in Virginia and West Virginia, totaling approximately 12.8 million acres. As such, the AIPM Project Area where treatment could occur is much larger than any previous project. However, the actual treatment area could be much smaller than treatment occurring in some States per year under existing programs. The amount of treated area in AIPM per year will depend on monitoring and site conditions. This Program differs from current programs as defined on pages I-13 and I-14 of the DEIS.

38

timberland in western Albemarle County, Virginia which is a
mix of hardwoods and softwood trees (mostly hardwoods)
A significant part of the timber there could be damaged o
destroyed by gypsy moth infestation. In addition, as a taxpay
I also have an interest in and responsibility towards
having a voice in the way my tax dollars are spent.
4 Furthermore, I wish to encourage you to take an environmental
sound approach to gypsy moth control.
Here is what I concluded from reading the Draft EI
First, it looks to me like further spread of the gypsy moth
5 is inevitable, and that we will continue to have outbreak
years similar to 1981 when vast amounts of forest are
defoliated.
Second, the EIS portrays diflubenzuron as a relativel
safe chemical to employ in control of gypsy moths. However
based on our experience in the past with many other chemica
which we have been led to believe were safe, I must re
main very skeptical about its possible effects. I acknow-
ledge that in many respects it "looks good" when compared
with other insecticides. One is led to believe by the
EIS that diflubenzuron is a relatively narrow spectrum
6 insecticide, yet it is still not "species specific" as is the
biological control NPV. The fact is, the entire animal
phylum Arthropoda which includes insects, millipedes,
centipedes, spiders, crayfish, and crustaceans is characterize
by organisms having chitinous exoskeletons. Since
diflubenzuron interferes with chitin synthesis, then it is
7 potentially lethal to any arthropod. Even the EIS
acknowledges that it has proved to be lethal to many
non-target species. I believe the EIS unfairly
8 downplays the possible negative effects of diflubenzuron
-not just to arthropods but conceivably also to humans.
There have been many insecticides in the past which
after widespread use were found to have very negative
consequences for humans. I would not authorize use of
9 diflubenzuron on my own land, and I would sincerely
hope that you would not employ it in any large

4. Comment noted.

5. In areas outside AIPM, the situation will continue to be cyclic with periods of high defoliation and periods of low defoliation. As stated in the EIS, AIPM is trying to reduce the rate of spread and adverse impacts of gypsy moth. It is not an attempt to stop or eradicate the gypsy moth. Additional spread of the gypsy moth is probably inevitable in many areas of the eastern United States and increased amounts of defoliation will probably occur. This is primarily because normal State suppression only treats high populations on high-value sites. Low value sites are seldom treated because the treatment costs exceed the timber or related values and therefore are often defoliated.

6. The gypsy moth NPV is much more host specific than Dimlin. However, contrary to what is generally believed, not all insects are susceptible or as susceptible to Dimilin as the gypsy moth. For example, Dimilin is very ineffective against the eastern spruce budworm. Other insects require higher Dimilin rates to be effective, such as the Forest Tent Caterpillar and the Douglas Fir Tussock Moth.

7. Not all Lepidopterous insects are as susceptible to diflubenzuron as the gypsy moth. Dimilin has little effect on spruce budworm, and application rates are higher for forest tent caterpillar and Nantucket pine tip moth. Even higher rates are required to achieve control on numerous other forest insects, such as the green oak tortrix moth, satin moth, pine beauty moth, Douglas fir tussock moth. However diflubenzuron currently is not registered in the United States for application against these pests. In general, ants and termites would be unaffected at application rates used to control the gypsy moth. Because of the rapid decomposition of Dimilin in soil, no control has been obtained against soil insects and therefore little impact would be expected at rates applied for gypsy moth control. The effect of Dimilin on aquatic insects is discussed on II-6 of the DEIS. It may be true that Dimilin is potentially lethal to any arthropod but not at the rates that are applied for controlling gypsy moth. Also, the timing of application in relation to the biology of some arthropods may reduce the adverse effects on these organisms.

8. Our review of the literature available to us failed to reveal any reported human health effects attributed to the registered use of Dimilin. Furthermore, the risk assessment in Appendix C of this document indicates that the human health risks from normal and abnormal exposures to the insecticide are extremely low.

9. Comment noted.

38

scale in your gypsy moth control program.
Third, we have been made acutely aware by our
news media of the magnitude of the federal deficit.
Since we must make some cutbacks somewhere, I believe
this proposed Appalachian IPM program would be a good
10 place to start. To me, it looks like the preferred
alternative #5 would amount to throwing a great deal
of taxpayer's money at a problem which we cannot
solve. I believe use of diflubenzuron on large areas
of national forest would create many new problems
through disruption of the Appalachian forest ecosystems.
The possible negative effects of diflubenzuron outweigh any
11 benefits it could achieve in reducing gypsy moth populations.
Finally, I would not be in favor of totally
12 discontinuing the Appalachian IPM program as outlined
in alternative 1. Alternative 2 comes closest to
13 representing my views; however, I do not favor the large
scale use of Bt. I would like to see the IPM
program reduced to a less costly scale (than alternative 5
would be), with gypsy moth control programs confined to
14 use of NPV, disparlure, inherited sterility, and mass
trapping; in effect, using only biological control methods
which are species specific for the gypsy moth.
Thank you again for the chance to comment on
the Appalachian IPM program.

Sincerely,

Brian G. Scruby

10. Congress has authorized the AIPM Program and has provided funds through fiscal year 1989. Funding amounts for the remaining years of the Project undergoes the budget allocation process like any other program. Possibilities for reductions or increases in the Program exist, but it is not possible to determine the Program allowance until Congress acts on the budget.

11. As indicated in response no. 8, the effects of diflubenzuron have been discussed. The responsible official will select an alternative in the Record of Decision and provide rationale for its selection. If an action alternative is selected for implementation, additional site-specific analysis and appropriate NEPA documentation will be necessary before intervention occurs. The effects of diflubenzuron on the environment and the benefits obtained from such use will be carefully considered.

12. Comment noted.

13. Comment noted.

14. Comment noted.

39

Att'n: Dave Smith

15 DEC 1988

12-13-88

Further Comments (brief & general) on the DEIS for the AIPM:

1 Pg II 5 & 6 – Diflubenzuron
Diflubenzuron is by far, in my estimation, the best means of eradication, A/O control of the gypsy moth. Its toxicity to the soil, water, species, & ecosystems is limited, and its ability to degrade at short intervals is a plus. Used by itself, or in combination with later application of disparlure is another plus. Even reduction of other species' population is limited, thus a minimal adverse effect.

2 Pg II-4 – Inherited Sterility
Although eliminated from prime consideration, this still merits serious study & consideration. Large scale application is appealing, possibly effective, with zero adverse effect, and perhaps combine with diflubenzuron.

3 Pg II-6 – Parasites & Predacious Insects – Introduction of such could "back-fire", as natural ecosystem is vastly different from a controlled study, A/o lab experiment.

4 Pg III-23 – Final EIS paragraph would indicate low toxicity of diflubenzuron on mammals & non-mammals .... I still believe the chemical should preclude other primary ideas.

5 Pg IV-27 – We know effects of diflubenzuron on crops also minimal.

6 Pg IV-3 & 4 – No action would further spread the gypsy moth, reduce foliage, destroy some

Response to Comments in Letter No. 39

From: Bob Clement

Comment No.	Response
1.	Comment noted.
2.	Agreed. As discussed in Chapter II, inherited sterility will be used as an intervention tactic when conditions are suitable for its use.
3.	See Letter No. 28, response no. 2.
4.	If an action alternative is selected, further site-specific analysis and appropriate NEPA documentation is necessary before action occurs. Generally, it is desirable to use the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives.
5.	As stated in the EIS, mitigation measures will be employed to limit the amount of insecticide drift onto nontarget areas. Levels of diflubenzuron that may drift onto crops should be below the ADI Level (Appendix C).
6.	Comment noted.

species, adversely affect habitat, be cost pro- (2)
hibitive to States, farmers, local governments, etc.

General Comments:

In my opinion, all options in the EIS for the AIPM have merit, and show careful study as to control, eradication, & cost effectiveness. Although some have been "in effect", ruled out, I believe most, if not all, are good. Chemicals are the best means of
7 control known to man, and they are our friend, yet can be our enemy. With careful application, knowledge of terrain, study of weather patterns, co-operation of those in immediate application area, etc., we can control the gypsy moth, thus I would stress CO-OPER-
8 ATION, COST-EFFECTIVENESS, A/O COMBIN-ATION of more than one method of control & eradication. Colloquially, "Let's not put all our eggs in one basket"... The environmental
9 impact of these studies' applications — any — are so minimal, I don't see why we need worry about any long-range effects. If we do nothing, the problem only intensifies.

Sincerely,
Bob Clement
Box 57
Kincaid, WV 25119

7. Comment noted.

8. AIPM is to be a coordinated county, State and Federal gypsy moth program that employs a variety of intervention techniques to reduce the spread and adverse impacts of gypsy moth. Although the primary objectives of the project take precedence irrespective of economic values, an economic accounting of the project as explained on page I-3 of the DEIS will occur.

9. Comment noted.

40

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333

1 5 DEC 1988

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December 12, 1988

RECEIVED
DIRECTOR, NA-S & PF COOP.
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~~Director~~
Programs
Methods
Coordination
Pesticides
-9 Pest Coord
Clerical
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File

Mr. Duane L. Green
Acting Area Director
U.S. Department of
Agriculture
Forest Service
370 Reed Road
Broomall, Pennsylvania 19008

Dear Mr. Green:

We have reviewed the Draft Environmental Impact Statement (DEIS) for "Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project." We are responding on behalf of the U.S. Public Health Service (PHS). We were pleased to find a thorough assessment of the impacts of pest management methods on human health and safety in this DEIS.

The concern of PHS reviewers centered on the pesticides proposed for use in
1 this project. The NIOSH reviewer, who has had recent experience in surveying occupational health and safety hazards of biological insecticides, recommends the use of Bacillus Thuringiensis (BT) over chemical insecticides. In a NIOSH study of BT application in an Integrated Pest Management Project (IPM) in Lane County Oregon (report attached), the biological insecticide was found to be a safe and effective means for suppressing the gypsy moth. In the study, however, it was recommended that agencies considering large scale BT application pay specific consideration to those situations where a small
2 percentage of individuals (residents or workers) may experience adverse health effects because of individual susceptibility to biological insecticides. In this project, therefore, it is strongly recommended that the Forest Service implement a surveillance program which would identify and follow immuno-suppressed or hypersensitive individuals in the application area who may be at risk.

The public health risk due to the use of Diflubenzon was well documented in Appendix C of the DEIS. (The Forest Service should be commended for providing a plain language summary which is understandable to the average citizen in the application area.) While this chemical is relatively safe, cautionary measures are clearly justified to minimize occupational exposures. Measures
3 should include recommendations for appropriate personal protective equipment and a carefully designed program of work practices to minimize exposures during application. The general public should be fully advised as to the time and area where BT and Diflubenzuron are to be applied.

Response to Comments in Letter No. 40

From: Vernon W. Hook, MD, Assistant Surgeon General
Department of Health & Human Services

Comment No.	Response
1.	Comment noted.
2.	Comment noted. Efforts will be made to identify immuno-suppressed or hyposensitive individuals during the scoping and public meeting phase associated with the proposed site-specific actions. Individuals so identified will be provided appropriate instructions for avoiding Bt contact at that time.
3.	Mitigating measures to minimize exposure are discussed on pages II-35 - 37 of the DEIS. Additional measures are developed during site-specific analysis for individual treatment areas and in project work and safety plans. These are required for each suppression program. The public will be notified through local media as to when and where spray programs will occur. These procedures are addressed in the site-specific environmental assessments.

40

Page 2 - Duane L. Green

4 At actual field sites, it is not reasonable to expect application workers to make a consistently correct selection and use of protective equipment under physically stressful field conditions. The Final Environmental Impact Statement (FEIS) should include more details of proposed management/supervisory practices which are planned to insure compliance with the proper selection and use of personal protective equipment in the field.

5 To orient and reinforce worker understanding of documented exposure control policies, training and reorientation on approved work practices should be offered at the beginning of the pesticide application period and frequent intervals throughout the application period (including inspections for proper use, wear, contamination, etc.). Demonstration and training should be conducted at actual work sites to reflect representative working conditions. Supervisors should strictly enforce the proper wear and care of personal protective equipment at all times.

6 Residues from BT or Diflubenzuron on crops could be a concern. If substantial overspray or spray drift into crop areas could occur during pesticide application, the Forest Service should develop techniques to investigate if any substantial settling on crops has occurred in order to reduce and/or eliminate residues which might enter the human food chain.

Thank you for the opportunity to review this DEIS. We hope that our suggestions are useful to minimize the risks during actual insecticide applications. Please ensure that we are on your mailing list for the FEIS for this project as well as other documents which are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

Vernon N. Houk, M.D.
Assistant Surgeon General
Director
Center for Environmental Health
and Injury Control

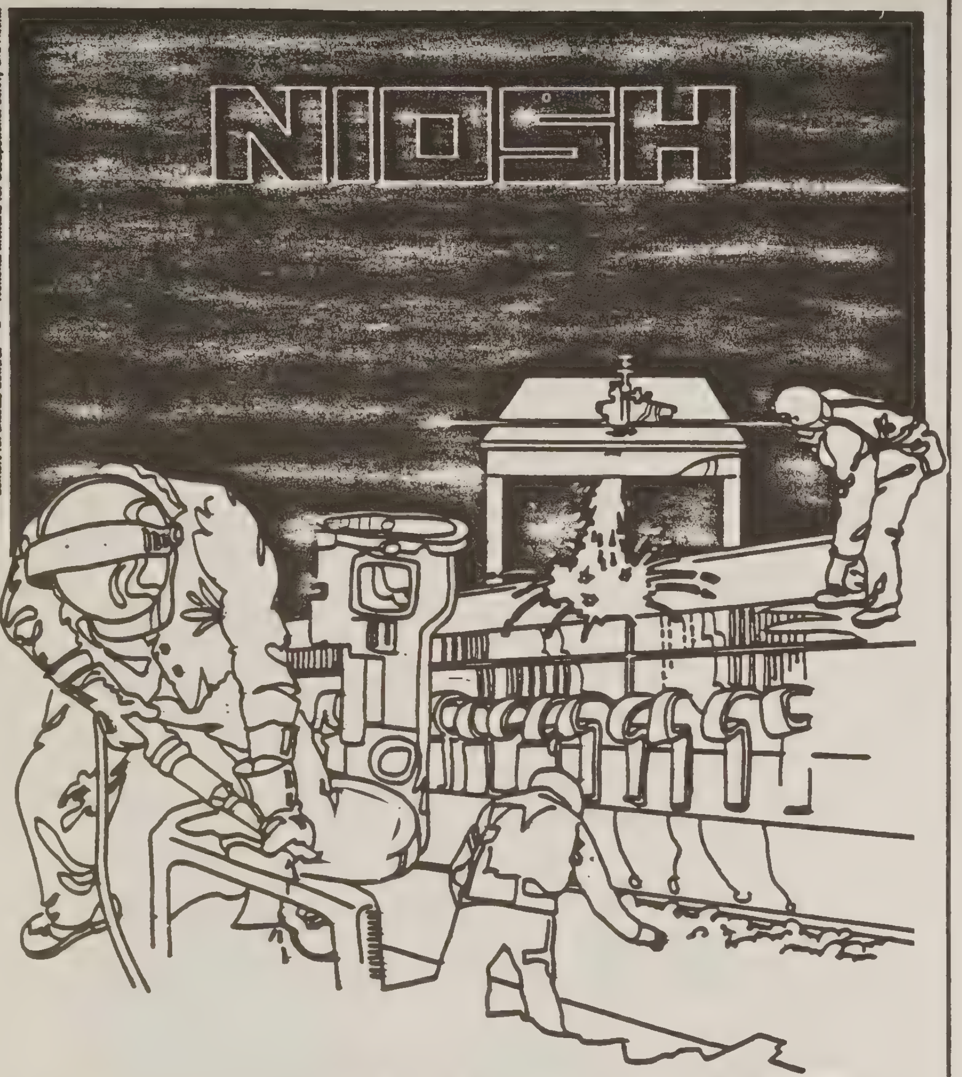
1 Enclosure
Health Hazard Evaluation Report

4. Before all application programs begin, the Forest Service requires a work and safety plan be submitted for review. Each of the participating agencies also has specific State or Federal requirements that address this point. In all cases specific label requirements concerning safety precautions are followed. Training is provided to all Federal and State mixers, loaders and applicators and all insecticides are applied under the direct supervision of a certified pesticide applicator. It is felt that these standard requirements will minimize unwanted occupational exposure.

5. Much of the handling and application of insecticides, (those jobs which have the highest degree of worker exposure), are done by separate contract with certified private applicators. Worker safety for these jobs is not covered by this EIS. See response no. 4 above. The Forest Service does job hazard analysis for all personnel involved in the suppression program and conducts a safety meeting prior to any application.

6. Mitigating measures to reduce drift are discussed on pages II-35 - 37 of the DEIS. The risk analysis in Appendix C evaluated the possible exposure of such indirect exposure. All possible doses to the general public were below the ADI. The risk analysis used very conservative assumptions, that is it uses very high exposure levels on crops that are not even present at the time of application. This was done to insure that the aerial application of insecticides within urban areas would not seriously impact the human environment.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service
Centers for Disease Control • National Institute for Occupational Safety and Health



Health Hazard Evaluation Report

HETA 85-309-1739
OREGON DEPARTMENT OF HUMAN RESOURCES
HEALTH DIVISION
GYPSY MOTH CONTROL PROJECT
EUGENE, OREGON

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 85-309-1739
October 1986
OREGON DEPARTMENT OF HUMAN RESOURCES
HEALTH DIVISION
GYPSY MOTH CONTROL PROJECT
EUGENE, OREGON

NIOSH INVESTIGATOR:
Larry Elliott, IH
OREGON STATE INVESTIGATORS:
Michael Huemann
Robert Sokolow
Steve Elefant

I. SUMMARY

On April 10, 1985, the National Institute for Occupational Safety and Health (NIOSH) was requested by the State Department of Human Resources, Health Division, Portland, Oregon to assist in the evaluation of occupational and general public exposure to *Bacillus thuringiensis* (*Bt*). *Bt* is a microbial agent used as an insecticide in the suppression and control of the gypsy moth, *Lymantria dispar*.

Approximately 250,000 acres of forest, rural, and urban areas were to be sprayed with *Bt*. The public health surveillance and infection monitoring programs, and safety procedures of the mixing and spraying application were reviewed on April 29 through May 1, 1985. A follow up survey was conducted June 2 through 6, 1986 during the second year spray application. Air sampling was conducted during both years to determine the occupational and general public exposure potential to the *Bt* during these spray operations.

The air sampling for *Bt* was conducted using MSA Model G and DuPont P-200 portable sampling pumps with 37-mm (0.8 micron pore size) cellulose ester filters as the collection media. The sampling duration ranged from 15 minutes to 4 hours at flow rates of 0.1 to 2.0 liters/minute with an open-face filter technique. The filter samples were analyzed for *Bt* by microbial culture technique. The sample results for the 1985 survey were deficient due to the inability to quantitate the positive cultures, and a blank sample contamination problem; however, all personal breathing zone samples were *Bt* positive. The sampling methodology and technique was modified for the 1986 survey to improve quantitation and eliminate sample contamination. Air samples collected before the 1986 application were all *Bt* negative. Air sample results collected in the personal breathing zone of individuals within the spray boundaries in 1986 ranged from 0 to 11,000 colony forming units of *Bt*/m^3.

Based on the air monitoring data collected, *Bt* exposure potential existed for various occupations and the general public within the spray area during, and for some time after, *Bt* application. The Oregon State Health Division should be consulted for results of the ongoing medical surveillance. Recommendations are offered in Section VIII concerning safety aspects of the mixing and application of *Bt*, and for future studies concerning biological pesticides.

Key Words: SIC 0851, *Bacillus thuringiensis*, microbiological insecticide, Gypsy Moth Control

II. INTRODUCTION

On April 10, 1985, the National Institute for Occupational Safety and Health (NIOSH) received a request for technical assistance from the Oregon State Department of Human Resources, Health Division, in Portland, Oregon. The Oregon Department of Agriculture was preparing to spray approximately 250,000 acres of forested and urban areas of Lane County Oregon with the biological insecticide, *Bacillus thuringiensis* (*Bt*), in an attempt to suppress and control the gypsy moth, *Lymantria dispar*. The Oregon Health Division had assumed the task of providing information to health providers and the general public regarding the spraying of the insecticide, as well as monitoring for attributable adverse health effects in the area. NIOSH was requested to assist in the planning and implementation of surveillance and monitoring activities of workers and the general public in the spray area. NIOSH researchers are interested in the use of microbial pesticides with respect to characterizing and documenting exposure potential to these agents. There are no regulatory standards or exposure evaluation criteria for microorganisms, therefore it is important to document exposure potential and determine if adverse health effects occur as a result of exposure to these agents.

A review of health surveillance and infection monitoring programs, safety procedures, and observations of the mixing preparation and application of the microbial pesticide was conducted on April 29 through May 1 and on May 13 through May 16, 1985. A follow-up survey was conducted June 2 through 6, 1986 during the second year of *Bt* spray application. The spray boundaries were slightly different the second year, although the acreage to be sprayed remained approximately 250,000 acres. Air sampling was conducted during both years to determine the occupational and general public exposure potential to the *Bt* during the mixing preparations and application of *Bt*. An interim report was provided to the Oregon Department of Human Resources, Health Division in February, 1986.

III. BACKGROUND

The gypsy moth is one of the most destructive insect pests for trees and shrubs in the United States. Since its introduction in the United States in 1869, the gypsy moth has extensively infested areas of 13 northeastern and mid-atlantic states. These infestations are of large proportions. Smaller, localized, infestations have been found in recent years in 17 other states across the nation. When the chemical insecticide DDT was available, the gypsy moth was almost eradicated from the northeastern United States, but as DDT use was curtailed, gypsy moth infestations became widespread.[1]

Currently, there are three EPA approved treatment procedures effective for the eradication of the gypsy moth. These consist of mass trapping and removal of the male moth, the use of biological insecticides, and the use of synthetic chemical insecticides. The state of Oregon chose, over the other options, to primarily use the biological insecticide Bt for its gypsy moth control project. Mass trapping was decided to be an ineffective alternative due to the size of the infected area. The use of synthetic chemical insecticide was limited because of obvious public health and environmental concerns. Bt was the selected biological insecticide because of its apparent low level toxicity to humans and fauna and its proposed effectiveness in large scale applications. Bt is a naturally occurring organism which is not prominently indigenous to all soils or environments. After approximately two decades of use as an insecticide, only two case reports of human infection by this organism have been reported; a corneal ulcer as a result of Bt, Kurstaki solution splashed in the eye and a localized infection of the hand as a result of an accidental innoculation with Bt, israelinsis and Acinetobacter calcoaceticus suspension.[2,3] Bt has been reported to be a mammalian pathogen in only one case where it was identified as the causal agent in a fatal case of bovine mastitis.[4]

Bt is very specific in its insecticidal activity affecting only insects having a caterpillar stage in their developmental cycle. The most destructive stage of the gypsy moth is the larvae or caterpillar. The distinctive feature of Bt is the presence of a bipyramidal crystal produced in the endospores during the dormant stage of the organism's life cycle. This crystal, delta endotoxin, is the principal active ingredient in Bt insecticidal formulations. To produce the formulation Bt, also known as Dipel®, is mixed with water and Plyac®, an emulsifier and dispersion adjuvant. The Bt formulation is applied by aerial spraying as a mist which settles on the foliage of the infested area. The Bt, and the toxin crystal, is ingested by the larvae as it feeds on treated foliage. The toxin crystal is comprised of a protein which is insoluble in acidic, but soluble in alkaline conditions. The alkalinity of the insect's mid-gut dissolves the protein resulting in paralysis and death of the insect.[5]

The Oregon Department of Agriculture, as part of its Integrated Pest Management Program (IPM) of 1984, trapped 16,000 male gypsy moths within Lane County, Oregon. This was evidence of ■ well established infestation of sufficient magnitude that officials felt control was in order. Failure to prevent the spread of the infestation would precipitate quarantine, inspection, and possible substantial economic loss of forest and agricultural products. Therefore, the Gypsy Moth Control Program for Lane County was developed and initiated during the months of April, May, and June, 1985. This program was staffed and operated by personnel from 3 state agencies, 4 federal agencies, and 2 aerial application contractors. The 1985 program's strategy to control the gypsy moth consisted of treating 34 acres with the

chemical insecticide orthene, 4800 acres with the chemical insecticide dimilin, and 250,000 acres with Bt. In 1986, Bt was selected as the only pesticide for use over approximately 250,000 acres. The Bt was applied using helicopters in three separate applications (approximately 7-10 days apart) over approximately 250,000 acres of forest, rural, and urban areas. The applications were made in the early morning hours from daybreak until about 10:00 am. This was the optimum time for application because meteorological conditions were best to prevent spray drift, as well as reduce exposure potential to the general public.

The 1985 Bt application was considered 97% effective based upon comparison of mass trapping studies before and after the application. The boundaries of the spray area were redefined accordingly to conduct the 1986 follow-up spray application.

IV. EVALUATION DESIGN AND METHODS

A complete review and evaluation of the project operational plans, accident prevention and safety plans, personal protection equipment usage, and work practices was conducted. The medical surveillance program of occupational and public health, including laboratory identification of infection isolates, was reviewed and discussed with representatives of the Oregon State Health Division, the Center for Infectious Diseases of the Centers for Disease Control (CID), and the Division of Surveillance, Hazard Evaluations, and Field Studies, NIOSH.

Personal exposure and area air monitoring for Bt was conducted during the mixing and aerial application procedures. This air monitoring was conducted using MSA Model G and DuPont P-200 portable sampling pumps with 37-mm (0.8 micron pore size) cellulose ester membrane filters (MF) as the collection media. The MF were contained in pre-sterilized plastic cassettes which were kept closed until the sampling was conducted; the sampling was conducted with an open-face filter technique. The pumps were calibrated, with the filters in line, at various flow rates of 0.1 to 2.0 liters/minute. Sampling duration ranged from 15 minutes to 4 hours depending on job operation or activity and was conducted to characterize exposure (occupational and/or general public) potential to Bt. The filter samples were analyzed for Bt by microbial culture technique.[6,7] The filter cassette samples received by the laboratory from the 1986 surveys, were individually packed in whirl pack bags. They were removed from the bags, dipped into a solution of bleach (1 part commercial bleach, 1 part water), and dried with a towel. Inside a biological safety cabinet, a cassette was opened and the filter was removed with sterile forceps. The filter cassette samples from the 1985 surveys were not individually wrapped, decontaminated with bleach, nor transferred inside a biological safety cabinet. Filters from the 1985 survey were removed with sterile forceps. The filter, from both surveys, was then placed face up in the center of a nutrient agar (Difco) Petri plate (150 mm).

All plates were incubated, inverted, for 24 hours at 30°C. Colonies were counted and the plates were left at room temperature for an additional 5 days incubation. Colony numbers were again checked.

Smears were made, stained, and examined.[7] Briefly, smear slides were made with distilled water, air dried, and lightly heat fixed. The slides were flooded with methanol for 30 seconds. The methanol was poured off and the slides were dried throughly by passing them through the flame of a Bunsen burner. The slides were flooded with carbolfuchsin Ziehl-Neelsen stain and heated from below with an alcohol lamp until steam appears. This step was repeated after waiting about 1 minute. The slides were washed in running tap water and air dried (without blotting).

All slides were examined under oil (1000x), for the darkly stained diamond-shaped toxin crystals. The presence of toxin crystals confirms identification as Bt.

V. EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptability, a pre-existing medical condition, and/or a hypersensitivity (e.g. allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria.

Workplace evaluation criteria for microbiological agents do not exist as for chemical or physical hazards, however, interest has been heightened during the past two decades on problems caused by microorganisms in the work environment.[8] It is well known that high concentrations of inhaled microorganisms can cause an allergic lung disease called extrinsic allergic alveolitis, also termed hypersensitivity pneumonitis.[9,10] Certain microorganisms are known pathogens (they have the ability to produce disease) and are grouped according to virulence (degree of pathogenicity). Bt has not been known to cause allergic alveolitis and is not considered a virulent pathogen.[2,3]

NIOSH is interested in the use of microbiological insecticides with respect to characterizing and documenting exposure potential to these agents. This interest involves efforts to identify adverse health effects in susceptible and/or healthy individuals attributable to exposure to such microorganisms or their products. Environmental, occupational, and public health concerns relative to the use of synthetic chemical pesticides are prompting an increased interest in the use of microbiological insecticides. As part of this interest, biotechnology (especially genetic engineering and recombinant DNA) is playing an important role in the development and proposed use of biological pesticides.[11] Therefore, it is important to explore ways to characterize exposure (sampling and analysis methods) as well as document the exposure potential, and determine if adverse health effects occur as a result of exposure.

VI. RESULTS AND DISCUSSION

The gypsy moth control project operational plans, safety objectives and plans, and the passive medical surveillance program instituted by the State Health Division were reviewed. These efforts were found to be comprehensive, well formulated, and properly directed. Several suggestions and recommendations were offered to improve safety conditions and/or reduce accident potential (these are listed in the recommendations section of this report). The safety and health attitude of, and effort exhibited by, the project personnel was excellent.

Twenty-four laboratory environment cultures and 7 spill sample cultures were submitted for Bt analysis during the 1985 application. Twenty-three of the 24 (95.8%) environmental isolates, and 3 of the 7 spill sample cultures obtained during the 1985 application were confirmed positive for Bt. The medical surveillance and environmental isolates monitoring for the 1986 application were underway at the time of this report. Results of this monitoring may be obtained from the Oregon Department of Human Resources, Health Division, Portland, Oregon.

Laboratory environmental culture samples were obtained in laboratories and/or hospitals in the spray area using settling plates containing culture media which were left open for 10 minutes. The results of this sampling (95.8% positive for Bt) during the 1985 application indicate the ubiquitous distribution of Bt throughout the environment of the Eugene, Oregon area after the spray application. These results could also indicate poor aseptic transfer technique (i.e., introduction of Bt from a source external to the sampling/analysis effort) although these laboratories were not transferring or handling stock cultures of Bt and thus the organism as sampled was probably the result of environmental contamination.

The 7 spill samples from 1985 consisted of soil and water samples from Bt spill sites. The 4 confirmed Bt negative samples indicate the effective effort to decontaminate the areas where the spills occurred. Sodium hypochlorite solution was used as the decontaminating agent. A comprehensive spill management program had been developed by the project safety staff to include proper reporting of the spill incident, location, cause, and extent of corrective action taken. Spill kits consisting of personal protective equipment and the necessary items to contain and clean up contaminated material were supplied to all project teams.

Table 1 presents the 1985 personal Bt exposure monitoring data by job operation and title. The results are reported as positive (POS) or negative (NEG) for Bt. Confirmed positive Bt cultures were counted (when possible) and reported as colony-forming-units (CFU). Generally, any plate that had more than six CFUs were overgrown to the point that individual colonies were indistinguishable. In these cases the samples were graded as: POS-A (1/2 the plate was covered), POS-B (3/4 the plate was covered), and POS-C (the entire plate was overgrown). Normally, sampling results of this type are reported as a concentration, CFU/cubic meters (m^3) of air. This reporting approach was not used for the 1985 results due to the limitations of the method in this particular circumstance. While this method appeared to be less than an optimal means of quantifying exposure, it at least provided a qualitative indication of Bt exposure during the sampling period. These results show that all individuals in the job titles sampled experienced airborne Bt (inhalation) exposure. The average sampling collection time was 50 minutes at an average air flow rate of 1.7 liters/minute. Samples were collected during the application of the spray (direct exposure), as in the cases of the batch truck driver and the load checker, and under non-spray conditions (indirect exposure), as in the cases of the security guard and the service station attendant. Samples collected on the lead mixer and his helper show that they were exposed to Bt even though they conducted the mixing using closed system pumping controls. Possibly, their exposure resulted from the open hatches on the storage tank and truck tank. Incidental Bt exposure was noted in the cases of the safety chief and safety officer during early morning preparations for work while in their hotel room. This environment was probably contaminated with Bt via the officers' contaminated clothing and equipment. The helicopter pilot and observers inside the ship were exposed to Bt because the spray drifted into the flight path of the observation helicopter. The helicopter pilot in the application ship was exposed in the same manner.

Table 2 depicts the results of the 1985 ambient air monitoring for Bt by date and location. The results of this sampling are reported in the same fashion as the personal breathing zone results. These results also show the ubiquitous distribution of the organism. Bt was found upwind and downwind of the mixing operation, and during the loading of the batch truck. It was also found throughout the various offices of the Project Camp. Bt was found inside and outside a hotel

room, on a high school campus in Eugene which were within the spray boundary. Bt was found in the residence of the safety chief in Corvallis, Oregon. Bt was not found in one office trailer at the Project Camp, on the campus of the University of Oregon, outside the home of the safety chief, nor inside or outside the Prineville, Oregon home of the safety officer. Bt found in the sample from the safety chief's home may have resulted from contaminated clothing or equipment since his home is approximately 50 miles outside the spray area.

Along with the quantitative limitation previously noted, a secondary problem regarding contamination of control (blank) filter samples was also observed during the 1985 surveys. As shown in Table 3, of 11 control samples submitted, 7 had confirmed Bt colony growth. Two controls which were prepared in the hotel room on the night before the first sampling and Bt spraying occurred (April 29), were negative for Bt. Six control samples, all found to be Bt contaminated, were prepared in the hotel room after spraying had begun (May 15). Three other controls were prepared in Cincinnati in a "Bt-free environment" on May 23, one of which was found to be contaminated with Bt; while the other two were Bt negative. Additional precautions were employed during the 1986 survey to reduce contamination as a result of poor aseptic technique during the preparation and handling of the blanks in the field or during laboratory analysis. These precautions included: assembling the filter/cassettes and placing them in individual sterile whirl pack bags, sterilizing all individually wrapped filter/cassettes with ethylene oxide, decontaminating the outside of the cassette with bleach solution after sampling, and placing each sample in a sterile whirl pack bag for shipment to the laboratory. Additional aseptic precautionary technique was employed at the laboratory as previously mentioned. As Table 3 indicates, controls generated in the hotel room after the 1985 spraying had begun, were probably contaminated by that environment. This was substantiated by the control sample results for controls from the 1986 survey; one control sample (opened within the hotel room on the third day of the survey) was contaminated with Bt. Contamination of the 1985 control sample prepared in Cincinnati possibly occurred due to shipment with field samples or during laboratory procedures in Portland. This information indicates the extent of distribution of the Bt organism throughout the spray area, the robust viability of this sporeforming bacillus, and the caution required to conduct good aseptic sampling/analysis technique.

Ambient air monitoring results obtained prior to the 1986 Bt application are presented in Table 4. The first six samples listed were collected at locations within the 1985 spray boundary. These locations were selected to determine if Bt organisms were present from the previous years application. The last four samples in this table were collected in locations outside of the 1985 spray boundary for comparison with the first six sample locations. Considerable volumes of air were sampled and Bt was not found on any of these pre-application samples.

Table 5 presents the personal Bt exposure monitoring results from the 1986 survey. All of these samples were collected using a flow rate of 100 cc/min. This flow rate, as compared to that of the 1985 survey, brought into focus the quantitative range of the membrane filter method for this sampling circumstance. Sample results are reported in CFU/filter and then interpreted to CFU/m^3 of air. These results indicate Bt exposure potential for Bt application personnel as well as the general public. Breathing zone (BZ) samples for a safety officer, helicopter spray pilot, aerial observer, card checkers, and security guard indicated Bt exposure ranged from no exposure to 11,000 CFU/m^3. The highest exposure was that of a card checker who was in brief direct contact with the spray; this was the only sample in which direct contact with the spray was observed. All other samples represent collection periods after the spray application had ceased or the individual was removed from direct contact with the spray. General public BZ samples represented by a church custodian, a U.S. Postal Service employee, a grocery store clerk, and a service station attendant ranged from no Bt exposure to 1600 CFU/m^3. Samples for the church custodian and postal employee were collected in an area which had been sprayed with Bt 3-4 days prior to the sampling. The positive Bt exposure for the grocery clerk and the service station attendant represent sampling on the same day Bt application occurred. These two individuals were not observed to have been in direct contact with the spray.

General area Bt air monitoring results are presented in Table 6. In comparison with area air monitoring results for 1985 (Table 2), the hotel was not within the 1986 application boundary. On June 2 and 3, the hotel room was apparently not Bt contaminated; yet on June 4, 1900 CFU/m^3 were detected in this room. Results of 500 CFU/m^3, 800 CFU/m^3, and 50 CFU/m^3 at restaurant locations within the application boundary also indicate general public exposure potential.

A summary of the membrane filter sample results from both the 1985 and 1986 surveys is presented in Table 7. These results are listed as Bt positive and negative results by location (within versus outside the spray application boundaries).

VII. CONCLUSIONS

The Gypsy Moth Control Project conducted by the state of Oregon using the biological pesticide *Bacillus thuringiensis* appeared to be effective; the 1985 control project was determined to be 97% effective based on mass trapping studies before and after Bt application. This is the largest application and most effective kill rate of its kind documented in the United States.

Results of the air sampling for Bt indicated widespread exposure potential. The sampling method as utilized in 1985 was not an entirely effective method for quantitative determination of Bt environmental levels. It was, however, an effective qualitative tool to determine the presence of Bt. Method modifications (flow rate and

sample volume) along with improvements in aseptic sampling and analytical technique improved the quantitative ability of the method and reduced potential for sample contamination. Caution, with regard to aseptic technique during field sampling and laboratory preparation/analysis, is warranted because of Bt's viability and widespread dissemination in the spray area.

Effects of Bt exposure on immuno-suppressed or hypersensitive individuals have not been conclusively addressed to date by this surveillance. It is apparent from the infection isolates and indications of the personal breathing zone/environmental sampling results, that a Bt application of this magnitude promotes dissemination of the organism throughout the environment raising the exposure potential for the general public and across all occupations. It is prudent to continue the surveillance program and attempt to identify, and follow, individuals who may be at an increased risk.

Indications of the air sampling results, and observations made during the air sampling, for this project indicate that microbial insecticides of this type can be transmitted throughout the environment. Future sampling efforts and results should indicate the prominence and proliferation these organisms can gain in the environment after such wide scale application. Therefore, careful consideration should be given prior to the deliberate release (field tests) of genetically modified microorganisms. The public health, ecological, and occupational health consequences must be carefully explored and evaluated before these novel organisms are used.

Further survey efforts are required to fully evaluate the exposure potential in the use of biological pesticides and to evaluate microbial sampling/analysis procedures.

VIII. RECOMMENDATIONS

The following recommendations were offered to the Safety Chief, the Project Director, and the Oregon State Health Division after the project safety programs and procedures were reviewed and the Bt mixing and application procedures were observed. These recommendations are based on good industrial hygiene practices or cited references and should reduce the potential for an accident or exposure.

1. To prevent splash of Bt to the eye, all personnel handling (transferring) Bt in solution should be required to wear eye protection. Bt has been documented to cause a corneal ulcer.[2]

2. Because of the magnitude of these applications, and the fact that small (5 gallon) containers present a hazardous waste disposal problem, the dispersing agent (Plyac®) should be purchased in bulk. This would also alleviate handling problems and reduce potential for Bt exposure. The use of a fork truck to raise

plyac containers to the top of the batch truck for dumping should be evaluated for accident potential. Perhaps a scaffold would be safer and provide an easier means to accomplish this task.

3. Non-essential personnel activity in the mixing and application areas should be restricted, isolated, and if possible reduced. Visits by the news media and other interested individuals should be controlled to reduce accident (helicopter safety) and exposure potential. All visitors should be issued and required to wear passes identifying them as visitors.

4. Follow-up on accident and/or spill reporting is an important component of these programs. Failure to do so will result in a poor safety attitude of the personnel involved and the subsequent downfall of the reporting program.

5. Safety personnel should be involved in contract review prior to letting contracts. This would grant them the opportunity to provide input regarding safety issues, hazard concerns, and the ability to implement safety guidelines in the contract.

6. A field expedient eye wash station should be provided at the mixing operation and all aerial loading sites (heliports) in case of Bt, Plyac®, or gasoline splash. Contractors should be required to wear eye protection and rubber gloves when handling these materials.

7. A first aid kit should be provided at the mixing site. Water should be provided at the aerial loading sites for hand washing and sanitation purposes. Bt solution splashed on the skin should be washed with soap and water. All cuts and abrasions must be thoroughly cleaned and a topical antiseptic applied.

8. Exposure sampling of synthetic chemical insecticides used to eradicate the gypsy moth should be conducted for individuals performing the application, ground crews, and the general public in the vicinity of the application.

9. The ground crews at the heliports should be required to wear hearing protection during the landing, loading of Bt into the helicopter, and take-off.

The following recommendations are based on the results of the air sampling for Bt and are offered for consideration in future studies and sampling efforts concerning biological pesticides.

1. Research should be conducted to further improve the quantitative ability of the cellulose ester filter sampling method in its use as a microbial sampling method for sporulating organisms. The method, because of Bt's toxin production ability, is very sensitive (specific for Bt). This method is applicable for use in the evaluation of environmental microbiology in "clean rooms",

yet it must be improved upon for use in environments where high microbial aerosol concentrations are expected.

2. Extreme care, with regard to aseptic technique during sample collection and analysis, must be exercised to prevent sample contamination. The sample filter and cassettes should be prepared in a controlled environment or sterilized after they are assembled. The sample filter cassettes should be protected from contamination while in the field. The outside of the cassettes should be decontaminated using a suitable solution before they are opened to remove the filter. The filters should be aseptically removed from the cassette holder within a laminar-flow clean air bench.

3. Pre-application measurements (air sampling) for Bt presence should be conducted to determine background levels in the spray area. Air sampling in a non-application area should be conducted concurrently with sampling in the spray area. These sampling results would indicate background levels and possible meteorological dissemination of Bt; and, in comparison would give more meaning to the sample results from the spray area.

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TABLE 1
PERSONAL EXPOSURE TO BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
EUGENE, OREGON
APRIL-JUNE, 1985

DATE	JOB OPERATION, JOB TITLE	SAMPLING RESULT*	COMMENTS
4-30-85	Bt Mixing Operation		
	Lead Mixer	Pos.-A	Mixing conducted using closed system pumping controls. Exposure must have resulted from open hatches of storage tank and truck tank.
	Helper	Pos.-A	
5-1-85	Bt Application		
	Batch Truck Driver	Pos.-B	Driver experienced direct spray.
5-14-85	Bt Application		
	Batch Truck Driver	Pos.-C	Heliport area was in direct path of spray.
	Load Checker	Pos.-C	
	Observer/Visitor	Pos.-C	
	Safety Officer	Pos.-A	Safety officer remained in vehicle during spray.
	Helicopter Pilot	Pos.-B	
	Security Guard for Project Area	Pos.-2CFU	Upwind from mixing operation.
5-15-85	Bt Application		
	Helicopter Pilot	Pos.-A	Bt spray noted on windshield of helicopter during spray.
	Air Observer in Helicopter	Pos.-A	
	Air Observer in Helicopter	Pos.-B	
	Service Station Attendant in Eugene	Pos.-6CFU	Worksite within spray area.
5-16-85	Bt Application		
	Application Team Leader	Pos.-C	During spray application.
5-17-85	Bt Application		
	Fuel Truck Driver	Pos.-B	Heliport in spray area.
	Batch Truck Driver	Pos.-C	

TABLE 1 (continued)
PERSONAL EXPOSURE TO BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
EUGENE, OREGON
APRIL-JUNE, 1985

DATE	JOB OPERATION, JOB TITLE	SAMPLING RESULT*	COMMENTS
5-31-85	Safety Chief	Pos.-C	Early morning samples in hotel room.
	Safety Officer	Pos.-C	
6-1-85	Bt Application		
	Load Checker	Pos.-C	Not in direct contact with spray.
	Helicopter Pilot	Pos.-C	
6-3-85	Bt Application		
	Team Leader	Pos.-A	Not in direct contact with spray.
	Fuel Truck Driver	Pos.-C	

* Sampling results are reported as Pos. (positive) or Neg. (negative) for Bt. Positive Bt colonies were counted and reported as colony forming units (CFU). Generally, any plate that had more than six CFUs were overgrown to the point that individual colonies were indistinguishable. In these cases the samples were graded as: A=1/2 the plate covered, B=3/4 of the plate covered, and C=the entire plate was covered with Bt.

TABLE 2
AREA AIR MONITORING FOR BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
EUGENE, OREGON
APRIL-JUNE, 1985

DATE	JOB OPERATION, JOB TITLE	SAMPLING RESULT*	COMMENTS
4-30-85	Mixing Area, Project Camp	Pos.-A	Downwind during mixing operation.
	Mixing Area, Project Camp	Pos.-5 CFU	Upwind during mixing operation.
5-1-85	Heliport L-16 During Application		
	Next to Helicopter During Loading	Pos.-A	
	Next to Batch Truck	Pos.-B	
	Upwind from Batch Truck	Pos.-A	
	Spray Area P-2 During Spray	Pos.-C	
5-14-85	Mixing Area, Project Camp		
	Downwind-Unloading of Bt	Pos.-6 CFU	
	Upwind Loading of Batch Truck During Mixing	Pos.-B	
	Between Storage Tanks	Pos.-A	
	Gypsy Moth Camp Offices		
	Public Information Receptionists Desk	Pos.-B	4-6 personnel in office.
	Administration Office	Pos.-A	3-4 personnel in office.
	Safety Office	Pos.-A	2-4 personnel in office.
	Bulletin Board Area (Outside)	Pos.-2 CFU	
	Bulletin Board Area (Outside)	Pos.-6 CFU	During spray of Bt.
	Hotel in Eugene		
	Inside Room	Pos.-2 CFU	
	Parking Lot	Pos.-2 CFU	
5-15-85	Roadside of Spray Area	Pos.-4 CFU	Sample 2 hour after spray, no traffic.
	Roadside of Spray Area	Pos.-B	During traffic conditions.
	Gypsy Moth Camp Offices		
	Planning Chief Trailer	Pos.-A	3-4 personnel in office.
	Operations (north) Trailer	Neg.	2-3 personnel in office.
	On Campus of Univ. of Oregon	Neg.	Non-spray area.
	On High School Campus	Pos.-A	Spray area/4 hours after spray.

TABLE 2 (continued)
AREA AIR MONITORING FOR BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
EUGENE, OREGON
APRIL-JUNE, 1985

DATE	JOB OPERATION, JOB TITLE	SAMPLING RESULT*	COMMENTS
5-31-85	Safety Chief's Residence-Corvallis		
	Outside of Home	Neg.	Approximately 50 miles from spray area.
	Inside of Home	Pos.-B	
6-1-85	Safety Officer's Residence-Prineville		
	Outside of Home	Neg.	Approximately 160 miles from spray area.
	Inside of Home	Neg.	
6-3-85	Hotel in Eugene		
	Porch Area in Front of Safety Officer's Room	Pos.-A	Within spray area.

* Sampling results are reported as Pos. (positive) or Neg. (negative) for Bt. Positive Bt colonies were counted and reported as colony forming units (CFU). Generally, any plate that had more than six CFUs were overgrown to the point that individual colonies were indistinguishable. In these cases the samples were graded as: A=1/2 the plate covered, B=3/4 of the plate covered, and C=the entire plate was covered with Bt.

TABLE 3
MEMBRANCE FILTER CONTROL SAMPLES
BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
APRIL, 1985 THROUGH JUNE, 1986

DATE	CONTROL SAMPLE TREATMENT	Bt CONTAMINATION Pos.	Bt CONTAMINATION Neg.	REMARKS
April 29, 1985	2 pre-assembled and pre-sterilized filter/cassettes were labeled, opened and immediately re-closed in the hotel room.		2	Bt spraying had not yet begun.
May 15, 1985	6 pre-assembled and pre-sterilized filter/cassettes were labeled, opened and immediately re-closed in the hotel room.	6		Bt spraying had been occurring for 2 weeks. A filter sample collected in the room on May 14, 1985 was Bt positive.
May 23, 1985	3 pre-assembled and pre-sterilized filter/cassettes were labeled, opened and immediately re-closed in NIOSH's Cincinnati, Ohio Laboratory.	1	2	Contamination probably occurred due to shipment with field samples or poor aseptic technique in opening the cassettes for analysis.
April 22, 1986	1 pre-assembled and pre-sterilized filter/cassette was labeled and placed in sterile whirl pack bag at the Gypsy Moth Control Camp.		1	
June 3, 1986	1 pre-assembled and pre-sterilized filter/cassette was labeled, opened and immediately re-closed, and placed in sterile whirl pack bag in hotel room. A second filter/cassette received the same treatment except the cassette was not opened.		2	
June 4, 1986	2 pre-assembled and pre-sterilized filter/cassettes were labeled, not opened, and were placed in sterile whirl pack bags in the hotel room.		2	
	2 pre-assembled and pre-sterilized filter/cassettes were labeled, opened and immediately re-closed, and placed in sterile whirl pack bags in the hotel room.	1	1	A filter sample collected in this room on this date indicated the room was contaminated with Bt. See Table 6.
June 5, 1986	2 pre-assembled and pre-sterilized filter/cassettes were labeled by marking the outside of the whirl pack bag in which they were sterilized. These samples were removed from the original whirl pack bag at the laboratory for analysis.		2	

TABLE 4
PRE-APPLICATION AREA AIR SAMPLES
BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
1986

DATE	LOCATION	SAMPLE VOLUME (LITERS)	COLONY FORMING UNITS/m^3	REMARKS
April 18, 1986	Mixing/Storage Area of Project Camp#	59	0	During receipt of Bt delivery from supplier.
April 21, 1986	Window (open) Sill Hotel Room#	77	0	
April 22, 1986	School Campus#	203	0	
April 26, 1986	At 1985 Bt Spill Site#	82	0	Spill area had been decontaminated immediately after spill.
April 29, 1986	Service Station in Eugene#	78	0	
May 4, 1986	Mobile Home of Mixing Operator#	61	0	Mobile home was set-up on site at Project Camp.
April 19, 1986	Personal Home of Safety Chief+	71	0	Home is located 60 miles north of spray area.
April 23, 1986	Service Station in Eugene+	200	0	
April 27, 1986	Oregon State Department of Forestry Eugene Office+	188	0	
April 28, 1986	Hotel next to Interstate I-5+	124	0	

* These membrane filter samples were collected at the noted locations before any 1986 Bt spray application occurred. These locations which were within the 1985 Bt spray application area are indicated with #, and locations outside of the 1985 Bt spray area are so indicated with +.

TABLE 5
PERSONAL BZ AIR SAMPLES
BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
JUNE, 1986

DATE	JOB TITLE	COLONY FORMING UNITS/FILTER	SAMPLE VOLUME (L)	COLONY FORMING UNITS/m^3	REMARKS
6-3-86	Safety Officer	53	14.6	3600	Sample taken during office activities.
	Helicopter Pilot-Spray Ship	6	4.5	1300	Air vent on ship-open
	Aerial Observer	9	6.7	1300	Air vent on ship-open
	Helicopter Pilot-Spray Ship	0	6.5	0	Air vent on ship-closed
	Aerial Observer	4	5.3	800	Air vent on ship-closed
	Church Custodian	0	8.7	0	During mowing the church yard. Area had been sprayed 3 days prior.
	Letter Carrier US Postal Service	0	6.7	0	Route had been sprayed 4 days prior.
6-4-86	Card Checker #3	0	14.7	0	Prior to placing cards.
	Card Checker #1	5	11.7	400	During placement of cards.
	Card Checker #2	66	11.7	5600	During placement of cards.
	Card Checker #1	12	21.1	600	During Bt application. Card Checker stayed out of spray.
	Card Checker #2	0	21.2	0	During Bt application. Card Checker stayed out of spray.

TABLE 5 (continued)
PERSONAL BZ AIR SAMPLES
BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
JUNE, 1986

DATE	JOB TITLE	COLONY FORMING UNITS/FILTER	SAMPLE VOLUME (L)	COLONY FORMING UNITS/m^3	REMARKS
	Card Checker #3	0	19.9	0	During Bt application. Card Check stayed out of spray.
	Card Checker #1	90	8.6	11,000	During Card Retrieval. Card Checker was in brief direct contact with spray.
	Card Checker #2	6	8.4	700	During Card Retrieval. Card Checker stayed out of spray.
	Card Checker #3	0	8.5	0	During Card Retrieval Card Checker stayed out of spray.
6-4-86	Grocery Store Clerk-Saginaw	5	4.9	1000	Store within same spray area days. Individual not in-direct contact with spray.
	Service Station Attendant-Creswell	7	4.3	1600	Station within spray area same day. Individual not in direct contact with spray.
6-5-86	Security Guard at Gypsy Moth Project Site	11	8.8	1300	Individual not in direct contact with spray.

TABLE 6
GENERAL AREA AIR SAMPLES
BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
JUNE, 1986

DATE	JOB TITLE	COLONY FORMING UNITS/SAMPLE	SAMPLE VOLUME (L)	COLONY FORMING UNITS/m^3	REMARKS
6-2-86	Hotel Room	0	5.5	0	Hotel not in 1986 spray area.
6-3-86	Mixing Tank and Pumping Station Project Camp Area	2	10.7	200	Mixing and pumping was not being conducted during sampling.
	Batch Truck at Heliport Loading Area	0	6.1	0	
	Restaurant Parking Area, Creswell	2	4.0	500	Restaurant area had been sprayed 3 days prior.
	Hotel Room	0	15.5	0	Same location as on 6-2-86
	Hotel Parking Lot	0	5.7	0	
	School Campus South Eugene	0	8.5	0	School was within spray boundary.
6-4-86	Intersection of England and Turkey Run Roads, Saginaw	57	13.5	4200	Sample collected after spraying was concluded.
	Intersection of Sears Road and I-5, Saginaw	0	8.9	0	Sample collected during spray period.
	Intersection of Sears Road and I-5, Saginaw	0	13.2	0	Sample collected after spray period.
	Intersection of Meyers Road and Witcher Gateway Road, Saginaw	3	6.2	500	Sample collected after spray period.
	Hotel Room	7	3.7	1900	Same location as 6-2-86.

TABLE 6 (continued)
GENERAL AREA AIR SAMPLES
BACILLUS THURINGIENSIS
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
JUNE, 1986

DATE	JOB TITLE	COLONY FORMING UNITS/SAMPLE	SAMPLE VOLUME (L)	COLONY FORMING UNITS/m^3	REMARKS
6-5-86	Hotel at I-5	0	13.9	0	Outside of spray area, same location as noted in Table 4.
	Restaurant Parking Lot, Springfield	16	20.2	800	Restaurant was within spray boundary.
	Inside Restaurant, Springfield	1	20.1	50	

TABLE 7

BACILLUS THURINGIENSIS (Bt)
SUMMARY OF Bt SAMPLE RESULTS*
GYSPY MOTH CONTROL PROJECT
LANE COUNTY, OREGON
1985 and 1986

	No. of Samples for 1985 Application		No. of Pre-Application Samples (1986)		No. of Samples for 1986 Application		
	Inside Spray Area	Outside Spray Area	Inside 1985 Spray Area	Outside 1985 Spray Area	Inside Spray Area	Outside Spray Area	Total
Bt Positive	42	1	0	0	18	1	62
Bt Negative	1	4	6	4	11	4	30
Total	43	5	6	4	29	5	92

*Numbers includes personal breathing zone and general area air sampling results.

40

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ROBERT A. TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

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HHS 396

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15 DEC 1988

December 12, 1988

David P. Smith
USDA Forest Service, Southern Region
1720 Peachtree Road
Atlanta, Georgia 30367

Dear Mr/. Smith,

This is my input on the plan for treatment of gypsy moth infestation, or possible infestation, in the George Washington National Forest, Appalachian Mountains, specifically in Bath County, Virginia:

1 I prefer Alternative #2, using B.T. or such controls harmless to other beneficial insects, with the amendment that wilderness areas also be sprayed with B.T. I realize no interference with natural developments in wilderness areas is considered with Alt. #2, but would think that in the interests of checking spreading into other areas an exception could be made to control gypsy moths.

Sincerely,

Virginia Dabney

Virgin ia Dabney
Route 1, Box 27-C
Millboro,VA. 24460

Response to Comments in Letter No. 41

From: Virginia Dabney

Comment No.	Response
1.	Comment noted.

42

15 DEC 1988

STATE OF MARYLAND
GOVERNOR'S SCIENCE ADVISORY COUNCIL
P.O. BOX 294, COLLEGE PARK, MARYLAND 20740

DONALD SCHAEFER
GOVERNOR

December 12, 1988

Mr. David P. Smith
EIS Team Leader
USDA Forest Service
AIPM EIS Team
Suite 718N
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

Dear Mr. Smith:

1 Thank you for the five copies of the Draft Environment Impact Statement for the AIPM Gypsy Moth Demonstration Project. The information received from you and the report will be very helpful to the Governor's Science Advisory Council in developing recommendations to Governor Schaefer about Maryland's gypsy moth program.

Sincerely,

W. L. Harris
Chair
Gypsy Moth Committee

Response to Comments in Letter No. 42

From: W. L. Harris, Chairman, Gypsy Moth Committee
Maryland Governor's Service Advisory Council

Comment No.	Response
1.	Comment noted.

43

16 DEC 1988

Fifth Planning District Commission

145 West Campbell Avenue P.O. Box 2569 Roanoke, Virginia 24010 (703) 343-4417

December 13, 1988

Mr. David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road, NW
Atlanta, Georgia 30367

Dear Mr. Smith:

1 Thank you for the opportunity to review the DEIS for the AIPM. My only question concerns the effect of the alternatives on groundwater quality, especially in areas with extensive limestone formations. This limestone can have solutional features, such as caverns and sinkholes, that allow quick penetration of surface pollutants into the groundwater. As quickly as these pollutants may enter the groundwater, other geologic formations may prevent further movement and dilution. Your DEIS discussion of water quality (p. III-4, IV 11, 20, 24, 31, 34) appears to address surface water only, and if groundwater quality is addressed, I was not able to locate any consideration of the alternatives' effect on groundwater quality in areas with extensive limestone formations. It would be appreciated if you could address this issue.

Sincerely,

Helen Smythers

Helen Smythers
Chief of Community Development

HS:jlp

Alleghany County • Botetourt County • Craig County • Roanoke County
City of Clifton Forge • City of Covington • City of Roanoke • City of Salem • Town of Vinton

Response to Comments in Letter No. 43

From: Helen Smythers, Chief, Community Development, Roanoke, VA

Comment No.	Response
1.	It is possible, if extensive defoliation occurs under alternative 1, a degradation of the taste, odor and color of the water in these limestone formations will occur during periods of heavy rain similar to the effects outlined on pages IV-11 and IV-12 of the DEIS. A nutrient flush of larvae, frass and leaf parts can be expected, particularly where direct water entry is possible. Lesser effects than those described can be expected for water that is filtered into these formations. None of the intervention tactics as described under alternative 2 should impact water quality in these limestone formations. The addition of diflubenzuron is not expected to affect water quality. The use of mitigating measures should minimize the amount of diflubenzuron entering water sources that directly enter limestone formations. Laboratory experiments indicate that diflubenzuron degrades rapidly (<3 to 7 days) in neutral or alkaline water and that field tests indicate the half life to be less than 24 hours (Willcox and Coffey, 1978). The water in most limestone formations tends to be alkaline in nature and it is expected that any diflubenzuron that finds its way into these limestone formations will quickly degrade and the potential for any type of persistence is quite low.

44

NEW RIVER VALLEY
PLANNING DISTRICT COMMISSION

16 DEC 1988

DAVID W. RUNDGREN
EXECUTIVE DIRECTOR

P. O. BOX 3726
RADFORD, VIRGINIA 24143
PHONE (703) 639-9313

COUNTIES OF:
FLOYD · GILES
MONTGOMERY
PULASKI

TOWNS OF:
BLACKSBURG
CHRISTIANSBURG
PULASKI

CITY OF:
RADFORD

December 12, 1988

MEMORANDUM

To: U. S. Department of Agriculture

From: David W. Rundgren, DWR Executive Director

Subject: Regional Clearinghouse Review of:

Appalachian Integrated Pest Management (AIPM) DEIS 1988
-799-

1 This is to advise you that the New River Valley Planning District Commission considered the Notification of Intent to Apply for Federal/State funds by the U. S. Department of Agriculture, for their project, Appalachian Integrated Pest Management (AIPM) DEIS 1988.

The Planning District Commission has determined that this project is a continuation of an existing or previously reviewed project and as such review has been waived.

Should you have questions concerning the status of this review, please do not hesitate to contact us.

cc: State Clearinghouse

Response to Comments in Letter No. 44

From: David W. Rundgren, New River Valley Planning Commission

Comment No.	Response
1.	Comment noted.

45

19 DEC 1988
(Atlanta)

DEC 16 1988

DEC 14 1988

NOVEMBER 22, 1988

DEAR MR SMITH,

I AM WRITING CONCERNING THE GYPSY MOTH DEMONSTRATION PROJECT PEST MANAGEMENT STATEMENT ISSUED BY THE U.S. DEPARTMENT OF AGRICULTURE.

I FIND THE REPORT TO BE VERY COMPREHENSIVE AND DETAILED ON HOW TO DEAL WITH THE GYPSY MOTH PROBEM. I AGREE WITH ALL
1 THE METHODS OUTLINED AND SUPPORT THE USE OF DIFLUBENZURON IF NECESSARY.

I AM AN ACTIVE MEMBER OF TROUT UNLIMITED AND FISH MANY OF THE STREAMS LOCATED IN THE COUNTIES OF AMHERST, ROCKBRIDGE, AND NELSON ~~IN~~ VIRGINIA. I WOULD HATE TO SEE DEFOLIATION TO OCCUR WHICH COULD ENDANGER THE SURVIVAL OF OUR NATIVE BROOK TROUT DUE TO INCREASED STREAM TEMPERATURES. I AM HOPING THE USE OF DIFLUBENZURON WILL HAVE ~~A~~ SMALL IMPACT
2 ON THE MAYFLY AND AQUATIC LIFE CYCLES WHICH TAKE PLACE IN THESE STREAMS.

I APPRECIATE THE EFFORT PUT OUT BY YOUR OFFICE.

MARK TARBET
P.O. BOX 88
GRETNA, VA. 24557

Response to Comments in Letter No. 45

From: Mark Tarbet

Comment No.	Response
1.	Comment noted.
2.	A few studies have looked specifically at mayflies or life cycles of various aquatic organisms. For discussion of effects of diflubenzuron on mayflies and some aquatic organisms see Letter No. 25, response no. 4 and Letter No. 63, response no. 3. An additional mitigation measure has been added to buffer trout streams in the AIPM area from applications of diflubenzuron.

19 DEC 1988

46

12521 Easy St.
Chester, Va. 23831
Dec. 15, 1988

David Smith, AIPM EIS Team
Suite 718 N
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

Concerning toxicity of Diflubenzuron

1 (1) Sulfhemoglobin in vertebrates - how quickly can a body cleanse itself of this?

(2) Who funded the different studies ~~that~~ you are using to prove its safety?

2 a) If funded by companies, groups, with an interest in promoting the use of diflubenzuron I would consider them suspect.

3 b) Study by Jones and Kochenderfer, p E-1, seems to incomplete to have any validity. Analysis of sediment was not done. Was analysis done downstream to

4 determine how far the diflubenzuron was transported? The drop to 25 ppt after 19 hrs. may merely be an indication that the chemical

Response to Comments in Letter No. 46

From: Pamela M. Rickett

Comment No.	Response
1.	Sulfhemoglobin remains in the human body until the affected blood cell is replaced. This is approximately 120 days maximum.
2.	The studies presented are funded through a variety of sources. Some of the studies are done by independent organization to provide EPA with requirements for registration. The manufacturer funds these studies. These studies have a standardized protocol established by EPA who reviews the data and determines its acceptability. The Forest Service's National Agricultural Pesticide Impact Assessment Program funded some of the research to determine the effect of diflubenzuron on the environment. Forest Service research as well as private and State universities have conducted additional research through competitive grants from various funding organizations.
3.	The Jones and Kochenderfer Study was designed to fill a data gap on the effect of aerial application of diflubenzuron. The objectives were to (a) determine the persistence of Dimilin in water, sediment, and the forest floor and (b) determine the impact of spraying an entire watershed on invertebrate populations in a small headwater stream.
4.	The analysis was performed at the base of the watershed which drained the treated watershed. This would be the highest level that would be recorded on that stream. If samples were taken further down stream they would have been diluted to levels below the sensitivity of the analytical equipment or bound to particles and sediment and removed from the water sample.

has been carried away to pollute downstream and not an indication of breakdown

c) Water samples taken in study by Mutanen, Siltanen + Kuukka, pg E-3,
5 indicates presence of diflubenzuron in water 2 months after application. Compare this to claims by Kingsbury, et al. pg E-2

d) Note increase in diflubenzuron in litter (Mutanen, et. al, pg E-3) one year after treatment. This sounds like diflubenzuron is
6 not going to break down on plants. This would create a problem if diflubenzuron is sprayed near edible plants, crops to be eaten by humans, animals raised for human consumption

7 We are still opposed to the use of diflubenzuron. If the forestry service insists on spraying diflubenzuron, we must insist that a buffer zone be
8 greater than 200 feet, since for an aerial application it would not take much air movement to carry the spray
9 beyond the buffer zone. We also

5. The difference in results of these two studies is due to the fact that persistence of diflubenzuron in the environment is determined largely by existing environmental conditions. Except in unusual circumstances, diflubenzuron is rapidly bound by soil or organic matter suspended in water. The half-life of diflubenzuron is influenced by temperature, ph, microbial activity, amount of suspended organic material in water, the particle size of the active ingredient and the substrate (soil, water, litter, sediment or foliage). The discussion of the fate in the environment of diflubenzuron in Chapter II of the FEIS has been expanded to explain more comprehensively the fate of diflubenzuron.

6. The relatively long persistence of diflubenzuron on foliage is discussed in Chapter II (see page II-7 of the DEIS). This discussion indicates that residual amounts can be detected up to 60 days. In the Mutanen et al 1988 publication, the detection of diflubenzuron in the litter layer one year after application was probably due to needle fall. Similar detection of Dimilin occurs in the litter layer of hardwood forests in the fall, after a spring application of diflubenzuron and is attributed to leaf fall. However, once the Dimilin has been introduced into the litter layer, rapid breakdown occurs.

7. Comment noted.

8. Reference to the 200-foot buffer zone adjacent to wilderness has been dropped. For the application of diflubenzuron, all water bodies and streams which are not canopy-covered will have as a minimum buffer zone of 200 feet. Before any alternative selected by the responsible official is implemented on public or private lands, additional site-specific analysis and NEPA documentation must be completed. In the site-specific evaluation of proposed treatment areas, specific mitigation measures will be developed for each intervention tactic proposed. These mitigation measures may be in addition to the measures discussed in the DEIS on pages II-35-37. Thus depending upon local conditions and type of aircraft used, larger buffer zones may be needed than discussed in the Draft EIS.

9. Before any alternative can be implemented on private lands in the AIPM Project, public meetings will be held to discuss the proposed project and to gather local issues and concerns. The meetings will be announced in local newspapers and other appropriate media. In addition, efforts will be made to contact all landowners within proposed treatment areas to inform them of the Project and of the proposed actions. Private landowners that object to having their land treated with the intervention tactics proposed can make their concerns known at the public meetings and when contacted personally. Participation in the AIPM Project is voluntary and no land can be treated without the lanowner or land manager's permission.

46

insist on being informed before spraying takes place.
10 We also think a system should be set up to monitor the environment for levels of diflubenzuron and its residues.

We are trying to start an "organic" farm on the east side of North Mountain, about 1 aerial mile south of the point at which Rt # 64 crosses North Mtn,
11 west of Lexington. It is extremely important for us for both our personal health and for the health of the people to whom we sell our produce, that our crops not be contaminated. We are beginning to deal with people who are ill with chemical sensitivities so it is extremely important that our
12 water sources, our soil and our crops be as free as possible from man-made chemicals.

Sincerely
Pamela M. Rickett

10. Operational monitoring of all insecticide applications will occur during and after application to insure that the insecticides are reaching the intended treatment areas. Monitoring in nontarget areas will also be done to minimize the effects of drift to these areas.

11. Participation in the AIPM Project is optional for each landowner or land manager. No land will be sprayed or treated without the landowner's or land manager's permission. Buffer zones will be established next to all nontreated land based on site conditions to reduce the potential drift of insecticides onto untreated areas.

12. Comment noted.

47

1 9 DEC 1988

APPALACHIAN TRAIL
CONFERENCE
WASHINGTON & JACKSON STS.
P.O. BOX 807
HARPERS FERRY, WV 25425-0807
TELEPHONE (304) 535-6331

December 15, 1988

David P. Smith
AIPM EIS Team
Suite 718N, 1720 Peachtree Rd., N.W.
Atlanta, Georgia 30367

Dear Mr. Smith:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (DEIS) for the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project. I am submitting my comments on behalf of the Appalachian Trail Conference, an organization representing 31 Trail-maintaining clubs and approximately 20,000 members dedicated to the protection and enjoyment of the Appalachian National Scenic Trail.

1 I am concerned that the only mention of the Appalachian National Scenic Trail is a cursory reference on page III-6 (the Index of the DEIS also contains the following statement: "Appalachian National Scenic Trail, –none"). Approximately 295 miles of the Appalachian Trail lie within the AIPM Project Area, on lands managed by the George Washington National Forest, the Jefferson National Forest, the Blue Ridge Parkway, the Shenandoah National Park, the Appalachian Trail Project Office, and several agencies within the Commonwealth of Virginia.

2 Comments submitted by the Appalachian Trail Project Office during scoping emphasized the need to inform hikers on the Appalachian Trail in advance of any aerial spraying activity on or near the Trail. Though the Forest Service appears to recognize the need to inform users of wilderness areas (page II-37, item #8) and of developed recreation areas such as picnic grounds and campgrounds (page II-36, item #6), there is no such commitment to inform users of the Appalachian Trail. *At a minimum*, hikers on the Trail should be advised of any pending aerial spraying activity and educated as to any risks associated with exposure. If necessary, the Appalachian Trail Conference and the Trail-maintaining clubs will cooperate with the Forest Service in distributing information and posting signs to inform users of the Trail of pest control measures which may affect them.

3 I would like to be informed of any specific pest control proposals on or near the Appalachian Trail, and to reserve the right to object to any measures that would adversely affect resource values and/or the hiking experience of the Appalachian Trail. I also feel that it would be appropriate to recognize the Appalachian Trail in any subsequent document, such as the Final Environmental Impact Statement or Record of Decision, and to consider use of gypsy moth specific tactics to minimize adverse impacts to other resource values near the Appalachian Trail.

Response to Comments in Letter No. 47

From: David N. Startzell, Executive Director, Appalachian Trail Conference

Comment No.	Response
1.	Comment noted. See Letter No. 23, response nos. 3 and 4.
2.	An additional mitigating measure (See Mitigating Measures section, Chapter II of the FEIS) has been added to the FEIS. All designated trails into treatment areas will be signed to inform trail users of planned gypsy moth treatment activities.
3.	See Letter No. 4, response no. 2.

Again, thank you for the opportunity to comment. If you have any questions, please don't hesitate to contact me or Don Owen of my staff.

Sincerely,

David N. Startzell
Executive Director

DNS/ar

cc: Mike Dawson, Appalachian Trail Conference
Margaret Drummond, Appalachian Trail Conference
Ray Hunt, Appalachian Trail Conference
Bill Gordge, Roanoke Appalachian Trail Club
Don Owens, Potomac Appalachian Trail Club
Roger Clifton, Old Dominion Appalachian Trail Club
Bill Rogers , Tidewater Appalachian Trail Club
Ed Page, Natural Bridge Appalachian Trail Club
Paul Brandt, Kanawha Trail Club

19 DEC 1988

48

Coastal Lumber Company

Timber and Land Department

Pioneer Division
BUCKHANNON, W. VA. 26201
Box 671
TELEPHONE 472-2841
AREA CODE 304

December 8, 1988

David P. Smith, EIS Team Leader
USDA Forest Service, Southern Region
1720 Peachtree Rd., NW
Atlanta, GA 30367

Dear Mr. Smith:

This letter is in response to the AIPM (Gypsy Moth Demon-
stration Project).
There are several points of this project which confuse me.
1 Without implementing an alternative which will stop or slow the
Gypsy Moth, only adverse effects will stem out of this.
Consider the timber on the affected areas, especially the
National Forests. The Forest Service owns areas which contain
2 larger, mature timber. This timber isn't as vigorous as young
timber and is more susceptible to insect damage. If allowed to
be exposed to repeated defoliation, it will be lost, with no
benefit, whatsoever, to anyone.
Defoliation of timber will result in loss or reduced mass
production. Because of this, two things will be affected: wild-
life populations and hunters who spend millions of dollars in
3 order to hunt game. If hunting prospects are poor, hunters will
either relocate elsewhere and take their money with them or will
stop hunting totally.
4 Repeated defoliation will decrease or stop the forests
ability to slow runoff. Water temperatures will probably rise,
thus producing a less desirable habitat for fish.
Not only does defoliation decrease and/or destroy the qual-
ity of timber, it does the same to trees that are there for the
5 sole purpose of providing a pleasant, scenic view. Most people
feel that a live, green tree is more pleasant to look at than a
dead, brown snag.
Under the National Forest Management Act, Forest and Range-
land Renewable Resources Planning Act and the Multiple Use Sus-
6 tained Yield Act, the National Forests must be managed to pro-
tect longterm productivity of the land. No treatment defeats
the purposes of these acts.
Areas which may be selected as not to have anything done
7 to prevent the spread of Gypsy Moth, such as Otter Creek Wild-
erness Area, Blueridge Parkway, etc., would be nurseries or

Managing Today's Forests For Tomorrow's Timber.

Response to Comments in Letter No. 48

From: Dwain Leach, Coastal Lumber Company

Comment No.	Response
1.	As stated on page I-6, item 6 of the DEIS, the Congress of the United States in 1987 directed the Forest Service to develop an integrated pest management project aimed at slowing the spread and minimizing the adverse effects of the gypsy moth. As part of this process, the Forest Service, in compliance with NEPA direction prepared the AIPM EIS. This document presented a no action alternative and five action alternatives, of which alternative 5 represents the preferred Forest Service alternative. The no action alternative is required by NEPA and provides for a comparison of the potential impacts between the action alternatives. Selection of the no action alternative applicable to all ownerships would not meet the intent of Congress. Thus, it is felt that the five action alternatives represent reasonable approaches that are capable of meeting project objectives.
2.	All of the action alternatives would allow some type of intervention in infested timber stands within the General Project Area on National Forest lands. If the AIPM Program is successful in attaining the objectives of minimizing the spread and adverse effects of gypsy moth, then the large mature timber should be protected.
3.	Significant defoliations do reduce production of mast (acorns, hickory nuts, etc.). Wildlife, which key on this type of food when it is available will forage over increasingly larger areas in search of food. Since this happens during most fall hunting seasons, squirrel, deer, bear, racoon and turkey hunters will notice changes in wildlife habits and dramatic shifts in populations (how many and where animals can be found). For game populations (squirrel, deer, bear, racoon and turkey) mast crop failures contribute to winter stress factors which does influence reproductive capabilities, however, history shows that in gypsy moth-defoliated areas, wildlife populations (including game) return to predefoliation levels and "normal" patterns rather quickly (usually one season). As you state, it is reasonable to assume that while game animals are responding to the effects of gypsy moth, hunters will tend to relocate (if possible).
4.	Defoliations caused by gypsy moth are short in duration (1-2 months) and occur at a time when seasonal stream flow and water temperature are not yet critical (May-July). (See Chapter IV, Alternative 1 - Effects on Fish & Aquatic Ecosystems). Repeated defoliations cause changes in forest composition which may influence stream flows for 1 to 3 years following heavy tree mortality. Slight increases in stream flow during defoliations and following heavy tree mortality would actually tend to "dilute" increases in water temperature resulting from canopy removal by gypsy moth. (See Letter No. 15, response no. 1).
5.	Comment noted.
6.	Comment noted.

48

Coastal Lumber Company
Timber and Land Department

Pioneer Division
BUCKHANNON, W. VA. 26201
Box 671
TELEPHONE 472-2841
AREA CODE 304

8 incubation areas for the perpetual growth of the Gypsy Moth. These areas could inturn infect areas which have been treated. It would be defeating the purpose of trying to slow or stop the Gypsy Moth spread. These areas, especially ones owned by the Federal Government, would seem to be liable for the infestation and/or prolong spread of adjoining lands. Either all is treated, in some method or another, or it is a futile attempt with the result of loss time, effort, money and taxes, and timber.

Set back and look at the long term effects of no treatment. They far outweigh the effects of no treatment. Look at the results on the overall population and area, not just a few areas or special-interest groups.

Sincerely,

Dwain Leach

Dwain Leach

Managing Today's Forests For Tomorrow's Timber.

7. As stated in response no. 2, wilderness may or may not be eligible for application of intervention tactics, depending upon which alternative is selected by the responsible official. If an alternative is selected that does not permit intervention in wilderness, then every effort will be made to keep the insect confined to the wilderness, while protecting the resources on surrounding public or private lands. On untreated wilderness lands, gypsy moth populations would follow the normal build-up and collapse as observed elsewhere in the eastern United States. Eventually, many of the susceptible host trees may be replaced by less susceptible or resistant species. This in the long term could reduce or minimize gypsy moth population build-ups and expansion into surrounding timber stands on public or private lands. Alternatives 4, 5 (preferred) and 6 allow for treatment of defoliating populations in wilderness if it is likely that these infestations will spread onto adjacent private lands and threaten the forest resources on these lands and it can be clearly shown that action outside wilderness to reduce or eliminate this threat will not be effective.

8. It is felt that the effects of no treatment as opposed to the effects of intervention under the various alternatives was presented in an unbiased manner. Anything that is implemented will have certain trade-offs. Eventually, the insect may infest the entire Project Area. However, if the initial heavy mortality of susceptible hosts can be minimized in the General Project Area, a continuing supply of forest resources should be available into the future.

49

19 DEC 1988

MCKELDEN SMITH, M.D.
~~STAUNTON MEDICAL CENTER~~ 3001 N. AUGUSTA ST.
STAUNTON, VIRGINIA 24401

12 - 15 - 88

David P. Smith, AIPM EIS Team
Atlanta, Ga.

Dear Mr. Smith,

I have reviewed the Draft EIS for the gypsy moth demonstration project in Va. + W. Va. It is a very impressive document and I congratulate you.

Of the six alternatives I favor # 3. It allows a full range of options for ~~the~~ the
1 general project area, but no management of gypsy moth populations in wilderness ~~areas~~.

As pointed out on page II-31 under "Supplemental attributes," the wilderness areas would serve as controls. I realize that wilderness and natural areas in Shenandoah National Park will not be managed for gypsy moth (page I-3), but I think the other (i.e. outside Park) wilderness
2 areas should be included ~~as~~ as controls so as to provide more geographical diversity.

I look upon what you are doing as a
3 stop-gap measure, all-be-it a most important and necessary one. It seems to me that

---

Response to Comments in Letter No. 49

From: McKelden Smith

Comment No.	Response
1.	Comment noted.
2.	In the Record of Decision, the responsible official will select an alternative and explain the rationale for its selection. The alternative may or may not include action in wilderness. If the selected alternative allows intervention tactics, additional site-specific and NEPA documentation will be performed before action occurs. Circumstances and general criteria are provided in the FEIS which provides guidelines for taking action in wilderness.
3.	The USDA Forest Service as well as several private companies are currently involved in biotechnology research aimed at improving current products or development of new products to control the gypsy moth. The Northeastern Forest Experiment Station (NEFES) at the Delaware, Ohio Laboratory is currently working on techniques to improve the efficacy of the gypsy moth nucleopolyhedrosis virus. One team of scientists is investigating GM virus DNA; a second team is seeking a GM hormonal modulator. Similar research is being conducted by the Canadians to improve the efficacy of Bacillus Thuringiensis. A private company, Ecogen Inc. of Langhorn, PA has developed a new product called Condor, a genetically-improved Bt product. Field trials of the biological insecticide were conducted in 1988 and several pilot tests are currently planned for 1989. Hopefully, significant biotechnology break-throughs will occur in the future to assist forest managers in reducing or minimizing forest impacts caused by the gypsy moth.

49

our best hope lies in some marvilous breakthrough in bio-technology, and I assume that the U.S. Forest Service is really pushing research in that field.

Thank you for letting me comment.

Sincerely,

M Kelden Smith

1 9 DEC 1988

50

United States Department of Agriculture | **Forest Service** | **Regional Office** | **1720 Peachtree Rd., NW Atlanta, Ga. 30367**

Reply to: 1950 (GMEIS)

Date: November 30, 1988

Dear Reader:

The date comments are due on the Appalachian Integrated Pest Management (AIPM) Draft Environmental Impact Statement has been changed to December 19, 1988.

As requested in the letter accompanying the Draft EIS, please provide us your reasons for your comment, and if your comment pertains to a specific part of the document, please give us the page number to which your comment refers. Submit your comments to David P. Smith, AIPM EIS Team, Suite 718N, 1720 Peachtree Rd., NW, Atlanta, GA 30367.

Thanks again for your interest and concern and I hope the extra time is beneficial to you in allowing for a more thorough review of the document.

Sincerely,

David P. Smith
DAVID P. SMITH
AIPM EIS Team Leader

12-17-88

PLEASE NOTE:

I HAVE NOT STUDIED, ONLY SCANNED THE MAJORITY OF THE DRAFT. I DID STUDY CHAPTER IV. MY CONCERNS ARE:

1 1. NO ESTABLISHED LAWS FOR MANDITORY CONTROL ON PRIVATE PROPERTY. IN WAR AGAINST ANY ENEMY OF THE NATION NO INDIVIDUAL SHOULD BE PERMITTED TO PROTECT THE ENEMY. WITHOUT TREES OUR NATION CAN NOT SURVIVE FOREVER. GET ACTION IN D.C. AND LAWS ON ANYTHING WHICH IMPOSES THREATS AND TAKE ACTION TO CONTROL ALL AREAS.

2 2. I DID NOT FIND ANYTHING ABOUT THE EFFECT ON NATIVE TROUT, THEY ARE DIFFERENT IN

Response to Comments in Letter No. 50

From: Lona G. Gilbert

Comment No.	Response
1.	The USDA Forest Service has no gypsy moth regulatory authority to require mandatory control of the insect on private lands within the AIPM Project Area. While it is desired that most landowners will allow some type of intervention method to be employed on their lands, some may not allow any type of intervention, as discussed on page II-15, alternative 2, paragraph 3, and on page IV-16, paragraph 2 under action alternatives of the DEIS. Should this occur, every effort will be made to protect adjacent resources on surrounding public or private lands using appropriate intervention methods to reduce gypsy moth spread and impacts.
2.	Native trout in the AIPM area are brook trout. Habitat preferences, food habits and basic ecology of the brook trout are slightly different than those for brown, rainbow or other trout species. However, the physiology of brook trout and where brook trout are found do not indicate that responses to effects of gypsy moth defoliations or applications of intervention tactics are different than those demonstrated by other trout species. Studies capable of evaluating some effects of gypsy moth on native brook trout are already under way. Mitigating measures for riparian areas have been reviewed to accommodate public concern for native trout in the AIPM area. As more and better information becomes available, modifications to the AIPM Project may be necessary to accommodate the needs of native brook trout.

50

SOME WAYS FROM THE RAINBOW TROUT. SURELY THIS CAN BE INCLUDED IN YOUR DATA.

I DON'T HAVE SIGNATURES OF MY SON & HIS WIFE BUT THEY ARE IN AGREEMENT WITH ME AND DID
3 REVIEW MY COPY OF THE DRAFT. THEY ARE ALSO TROUT UNLIMITED MEMBERS. THEIR ADDRESS IS AS FOLLOWS:

MARVIN G. GILBERT *
4 MARILYN S. GILBERT
RT. #4, BOX 168
AMHERST, VA. 24521

* WILL SUPPORT YOU IN ANY WAY YOU MAY NEED HIM. HIS AVAILABLE TIME IS CONTROLLED BY HIS WORK. HE TEACHES SCHOOL IN THE COUNTY.

THANKS FOR KEEPING ME IN TOUCH.

Lona G. Gilbert
BOX 274
AMHERST, VA. 24521

I ONLY HAVE 33 ACRES, MOSTLY WOODED. MEMBERS OF MY FAMILY OWN 244.5 ACRES - ALL WOODED, IN THE COUNTY.

3. Comment noted.

4. The address you provided has been added to the mailing list to receive the Final EIS and Record of Decision.

51

1 9 DEC 1988

December 14, 1988

111 Hayes Ave.
Charleston, WV
25314

David P. Smith, EIS Team Leader
USDA Forest Service, Southern Region
Suite 718N
1720 Peachtree Road, NW
Atlanta, Georgia 30367

Dear Mr. Smith:

I have reviewed the Draft Environmental Impact Statement for the AIMP Gypsy Moth Demonstration Program. The Forest Service has done an excellent job of compiling relevant information and presenting a logical set of Alternates.

1 Alternate 5 is the recommended alternate in the Draft EIS. I feel that Alternate 6 would be more effective for the following reasons:

2 1. The gypsy moth is not a natural species in the Appalachian Mountains. The use of diflubenzuron in wilderness areas would not, therefore, be interfering with the natural forces of nature.

3 2. Prohibiting the use of diflubenzuron in wilderness areas will leave over 270,000 acres somewhat unprotected if a building or heavy infestation occurs. Wilderness areas are considered by many to be more valuable than the general Project Area, and should have the option of equal protection.

4 3. It does not appear that diflubenzuron will have any long - term negative effects on other species.

5 I was somewhat torn between Alternates 1 and 6. If the gypsy moth was a native species, Alternate 1 would have been my preference. However, since the gypsy moth is an imported specie, I feel it should be controlled with every environmentally sound method over as much area as possible. Alternate 5 will limit the options in a large, valuable area.

The Draft EIS was excellent, interesting and informative. Thank you for this opportunity to express my views.

Very truly yours,

Joseph T. Carney

Joseph T. Carney

Response to Comments in Letter No. 51

From: Joseph T. Carney

Comment No.	Response
1.	Comment noted.
2.	It is true that gypsy moth is not a natural species in the Appalachian Mountains. However, diflubenzuron, a chemical insecticide is not a natural substance occurring in nature and as outlined in the EIS (Chapter IV, alternative 3). There are impacts to the natural environment with use of this insecticide. In addition, natural integrity as related to wilderness, is the extent to which long-term ecological processes are intact and operating. Human action such as the spraying of diflubenzuron will alter to some extent these natural processes as presented in the EIS.
3.	As explained in paragraph 2, page II-13 of the DEIS, wilderness will be impacted under all of the alternatives. This EIS provides information on the potential environmental impacts of both gypsy moth and intervention techniques considered for use. This information will provide the decision maker at the site-specific level with background information so that a management strategy can be selected that best complies with long range wilderness management goals. The consequences of using or not using diflubenzuron have been addressed in Chapter IV of the EIS. Wilderness can be treated under alternative 4, 5 and 6 if necessary to protect the wilderness resource.
4.	Effects of diflubenzuron in the environment could occur as long as the chemical persists in the environment (see Letter No. 4, response no. 1a, and Letter No. 53, response no. 41 for a discussion of the fate of diflubenzuron in the environment). For some additional discussion on effects of diflubenzuron, see Letter No. 25, response no. 4 and Letter No. 63, response no. 3.
5.	Comment noted.

52

1 9 DEC 1988

Mr Smith
I have studied the six Alternatives for the
A.I.P.M. Demonstration project and it looks like
the preferred Alternative 5 may achieve the
1 best results. I think it is the best because it
Contains tactics that may be used in Wild-
erness. Places in Wilderness that may have
small stands of Virgin timber left should
be protected by these tactics as well.
2 Moth-specific tactics and B.T. should be used
in Wilderness or any place where moth populations
are found. It seems there is always certain
risks involved any time a Chemical insecticide
3 is used. Diflubenzuron may be needed in
Certain areas but should be used with Caution.
Theirs is Concern about ground application of
moth-specific tactics. (Chapter 2-page-11)
I have visited the Cranberry Wilderness many
times. One can only imagine what this place
was like back befor the big timber was cut.
4 The signs of mans intrusions are everywhere.
When protecting what is left from being harmed
by Gypsy Moth i don't see un-natural devices
being visible as any big concern. If thay are
needed and will help. In some sensitive areas
we should use them. We all learn from

over

Response to Comments in Letter No. 52

From: Roger L. Wright

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	As described in Chapter II, further site-specific analysis and NEPA documentation will occur before intervention tactics are implemented. Generally, the least impacting intervention tactic available under a selected alternative will be used that is capable of achieving program objectives. Mitigating measures as described on pages II-32-37 of the DEIS will limit risks to the environment.
4.	Long term management goals and objectives for wilderness have been guided by the philosophy of minimizing human influence and allowing the free play of natural forces. Each wilderness is affected by a variety of human influences with the idea that the greater amount of human influence, the lower the purity of wilderness. Where a choice can be made between wilderness values (natural integrity, apparent naturalness, solitude, scenic values, primitive recreation opportunities and supplemental values) and other activities, the wilderness resource is the overriding value. In this case, if intervention techniques are determined to be necessary in wilderness to manage gypsy moth, the tactic chosen will depend upon a site-specific analysis and further NEPA documentation. This analysis will now consider both aerial and ground intervention tactics.

52

our mistakes and i think that various
Combinations of air and ground tactics
5 should be tried and studied in Wilderness
as well as the general project area.
Thank you and lots of luck with the A.I.P.M.

Roger L. Wright

5. Comment noted.

53

1 9 DEC 1988

SIERRA CLUB
WEST VIRGINIA CHAPTER

P. O. Box 4142
Morgantown, WV 26504

December 13, 1988
15

Mr. David P. Smith
USDA - Forest Service
1720 Peachtree Rd., NW
Atlanta, GA 30367

Dear Dave:

I appreciate being given the opportunity to evaluate the Draft Environmental Impact Statement for the Appalachian Integrated Pest Management Gypsy Moth Demonstration Project (AIPM). As Conservation Chair of the West Virginia Chapter of Sierra Club, I submit the following comments on behalf of the Chapter membership of just over 1,000.

Our basic underlying assumption is that the gypsy moth, although an exotic
1 organism in the U.S., is working its way into our environment for the long term, so that eradication at this point is not feasible. The Forest Service and most others have agreed with this assumption.

With this in mind, our view is that the primary role of treatment against the moth should be to help "ease" it toward its future equilibrium with the
2 environment in the area ahead of the moving front. This should be done in order to lower the negative impacts of gypsy moth infestation, while being <u>certain</u> to protect the environment against the potentially more-harmful effects of long-term treatment.

Our basic underlying concern relates to the size and location of the AIPM area and the situation that arises once treatment begins. It is reminiscent of acid mine drainage: once treatment begins it is very long-term. If millions of dollars
3 are poured into treatment over the next five years, and the source of funds lessens, or even dries up, might not the consequences be more devastating than letting the front go through unhindered? This is another reason that we highly recommend an emphasis on minimal treatment for the shortest period of time, enough to ease the population into the Appalachians.

There is always the possiblility that the gypsy moth population will get out of control in the AIPM area as the front moves through. (We all hope that this does
4 not happen, and that IPM early enough can prevent this.) In this case, however, we could not at this time support massive use of chemical insecticides, including diflubenzuron, or the biological Bt because of their harmful effects on numerous non-target native organisms.

I will make some comments on Wilderness, but would like to reserve the right to hold them until we talk on December 20. Thanks.

1. First, I want to compliment the Forest Service EIS Team for putting together an informative and readable document. The alternatives are well outlined, and
5 the environmental effects discussed in some detail. It is a good document on which to comment.

6 2. The need for this project is fairly-well justified, and how it differs from the APHIS eradication program is made clear. We are pleased to see that AIPM is

"Not blind opposition to progress, but opposition to blind progress."

Response to Comments in Letter No. 53

From: Mary Wimmer, Conservation Committee Chairperson
Sierra Club, WV Chapter

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	The Project Area was selected to provide a range of gypsy moth populations on which to evaluate the effectiveness of various control tactics. At the beginning of the Project, there was not sufficient data to determine where these population levels existed as well as areas that were uninfested. A large area was selected to insure all populations were represented. Population data from the 1988 pheromone survey indicates the selected area provides the desired population levels. If the AIPM Project did not exist, or if funding is stopped, areas that have potentially defoliating populations could be treated under the normal cooperative suppression program. Historically, fronts do not go through unhindered and action within both states in previous years bears this out. The AIPM program was developed to evaluate the feasibility of using tactics, in addition to aerial application of insecticide, to keep populations in selected areas at low levels in order to minimize impacts and reduce the risk of artificial spread. At the advancing front, the goal is to keep populations from building in hopes of reducing natural spread of larvae. At the end of the program it is hoped that tactics, other than those used in the current cooperative suppression program will be proven effective and will be used by resource managers across the nation.
4.	Not all gypsy moth populations will be treated under AIPM and some defoliation will occur. The "no action" option is available under all alternatives. The landowner or land manager may opt to not treat a particular infestation because of other resource reasons.
5.	Comment noted.
6.	Comment noted.

Smith, page 2

realistic in accepting that the gypsy moth is here to stay for a while, and approve of its aiming to soften the blow rather than try to remove every moth from the face of the earth, or the AIPM project area.

7 One of the strong points of AIPM is its demonstration nature which will allow development and evaluation of an integrated pest management approach to the gypsy moth problem. The careful monitoring activity for establishing locations of infestation is critical to the overall project, and as I understand it, this is the first time in the moth's history that thorough monitoring is taking place. Without this, on a continual basis, the remaining objectives would be unrealistic.

8 Another strong point of AIPM is its integration of more than one pest treatment method rather than the sole dependence on the chemical insecticide diflubenzuron (dimilin) or biological Bt. We strongly endorse this approach. Another aspect of the project that is critical is the lack of cost to landowners within the AIPM area which will remove the present monetary excuse for sole use of dimilin; we support as well the voluntary course of landowner involvement in AIPM, realizing the conflicts that may ensue from adjacent landowners.

9 <u>We would like to see a statement added as an integral part of AIPM objectives emphasizing protection of our native environment from the harmful effects of gypsy moth treatment activities</u>. This relates especially to treatment effects on non-target organisms. Considering the present evidence, "some of the cures are more harmful than the disease," except perhaps for those dependent upon oak-based industries who will necessarily have to adapt.

10 We would also like to see a clear recognition up front of the large number of <u>unknowns</u> we are dealing with considering the current nature of the art of gypsy moth control. This includes not only moth population trends and effects of infestation, but also effects of large-scale treatment on the native environment. It is very important for the public to understand that the demonstration nature of the AIPM Project reflects these many unknowns. Expectations are then more realistic, and a cautious approach can be justified.

11 3. We support the preparation of site-specific plans with environmental assessments using this EIS for tiering, assuming this would include further public involvement. Our only concern, as we have relayed to you before, is that the number of site-specific EA's be kept to a minimum to avoid constant bombardment of the public with documents to review. We understand that the number will be minimized.

12 4. P. v and beyond: Careful definition needs to be made of the meaning of the phrase "manage gypsy moth populations as necessary." I do not believe this has been done.

13 5. P. I-2 or elsewhere: What will happen at the end of five years? Some discussion should be added as to how AIPM fits into the long-term scheme of things. Otherwise why embark on such a massive undertaking?

14 6. Very good discussion on gypsy moth biology. Under "Current Situation" (p. I-13), some information should be provided about the differences in forest environment between the area through which the migrating front has already passed and that forested land which is yet to come.

15 7. P. II-4 on: When you describe an egg mass level for which a particular tactic is used, discussion needs to be added about what if more or less? For example, Disparlure is "normally used" in areas where there are less than 25 E.M./acre; why 25, and what happens with more?

7. Comment noted.

8. Comment noted.

9. Integrated pest management by design seeks to establish the least impacting course of action that achieves acceptable levels of control of a target pest. The intent of AIPM supports the development of low level and/or host specific tactics individually or in combination with other tactics. Page II-32 of the DEIS mentions, "In general, it is desirable to use the least impacting intervention technique available in the selected alternative that is capable of achieving project objectives."

The fundamental policy of AIPM appears in the following statement which describes intervention in wilderness (Alternatives Considered in Detail, Chpt II, FEIS); "If treatment is recommended, management tactics will be limited to those tactics that only affect gypsy moth if at all possible. If gypsy moth-specific tactics are unavailable or not feasible given the gypsy moth population level, <u>Bt</u> (under Alternative 5) and/or Diflubenzuron (under Alternative 6) will be considered as a last resort."

10. This information can be found on page IV-35 - 36 which identifies research needs. These needs include the evaluation of the effect of insecticide treatments on nontarget organisms.

11. Each major land manager has the responsibility to decide the actions that will take place on the lands under his jurisdiction. This is accomplished through site-specific analysis of proposed actions. The land managers involved in this Project are the Supervisors of the three National Forests, the Superintendents of the Shenandoah National Park and Blue Ridge Parkway, and the appropriate officials in the States of Virginia and West Virginia. Consolidation of documents between managers under the same agency will occur as appropriate to minimize the number of documents prepared each year.

12. When it will be "necessary" to manage gypsy moth populations in wilderness was not fully discussed in the DEIS. During the public comment period, AIPM personnel met with representatives of key environmental groups to develop specific circumstances under which it may be necessary to manage gypsy moth in wilderness. (Chapter II, Description of Alternatives in FEIS).

13. See response no. 3 above.

14. The discussion presented under "Current Situation" was intended to describe current Forest Service suppression and APHIS Regulatory programs, goals and objectives so the reader could see the differences between these programs and the proposed AIPM Project. Information concerning the forest environment as well as other environmental information relative to the AIPM Project Area is presented in Chapter III, Affected Environment. Studies cited on page IV-4 of the DEIS discuss the impacts of gypsy moth on forest types in Pennsylvania that are generally comparable to forest stands within the Project Area. Speculation on the impacts or effects on the forest environment beyond the project boundaries to the south is beyond the scope of this document.

15. The egg mass levels represent the maximum egg mass density against which a tactic has been scientifically evaluated. All of these low-level tactics become less effective as population density increases, whereas effectiveness should remain unchanged for specific tactics at lower densities. The preciseness of these numbers will vary with the accuracy of the estimate (i.e., depends on the technique used to estimate egg mass numbers).

Smith, page 3

16 8. P. II-5: How much Bt is of comparable effectiveness to dimilin? You give the ai/acre for diflubenzuron, but not for Bt.

17 9. P. II-5, last paragraph: I believe "phenylurea-based" is more accurate than "urea-based" when describing dimilin.

10. P. II-6: This page needs to be changed. I take serious exception to the virtually sole use of the 1978 Willcox and Coffey paper in describing the
18 "harmlessness" of dimilin, especially when it comes to its environmental fate. Note that most of the references in this paper are file numbers, not published research, of the Thompson-Hayward Chemical Co. in Kansas City, often referenced to dimilin producer Philips-Duphar (might they have a slight economic interest in dimilin's safety??).

Siting one such file, for example, Willcox and Coffey indicate that the half-life of dimilin in water is less than 24 hours. Although it is admitted here that this is related to the microbial action of suspended organic matter in the water, omitted are the temperature and pH effects which are mentioned on p.
19 IV-24 (see 28 below). <u>In water at pH 4, Ivie et. al. (1980) find less than 1% dimilin degradation after 60 days, and over 50 % remaining after 7 days at pH 6. This clearly should be discussed considering the acidity of many of the streams in the AIPM area</u>, whether due to natural acidity, or man-made (acid precipitation, acid mine drainage). The cold temperatures occurring in many of these streams should also be recognized as slowing degradation.

To be degraded, dimilin must reach the microorganisms that apparently do most of the degradation, by biochemical means. Have any studies been done as to
20 the efficiency of this process in clear, fast-moving mountain streams? How much suspended organic matter is in such a stream? (I suspect little.)

Fate in soil depends as well on a number of factors, especially the microorganism population; studies by Mansager, et. al. (1979) and Martinat, et. al. (1987) show degradation, but the results are either variable or inconclusive. On
21 leaves (1979 study) and on citrus fruit (Nigg, et. al., 1986), dimilin is reported to persist for <u>months,</u> as you indicate on p. II-7. In the Mutanen, et.al. reference on p. B-3, dimilin is actually found to increase in the forest litter the year after application, which the authors attribute to needle fall during the autumn; again the persistence of dimilin on leaf surfaces is confirmed.

Your statement quoting Willcox and Coffey that the effects on non-target organisms will be "temporary because of the rapid degradation of the active ingredient" does not agree with published research when our generally
22 unpolluted, cold, acidic mountain streams are considered, and your discussion should be changed. And if, as Willcox and Coffey say, effected aquatic populations recover within "14 to 28 days in most (define 'most') cases," what happens to the ecosystem during that time? It does not stand still! What percent of the diet of our native trout and other fish (including those that are endangered) are these non-target organisms? This should be discussed as well.

23 Have there been any studies on the effects of long-term and wide-spread use of dimilin or Bt in an area? What about behind the moving front?

11. P. II-7, paragraph 1, last sentence: I understood that silvicultural treatment is not supposed to be an option in the AIPM program, and yet this sentence opens
24 the door. The entire AIPM is a "demonstration area." If silvicultural treatment will be a tactic used, it should be fully discussed as are the others, and <u>very clearly prohibited in Wilderness Areas</u>. For example, who will decide where the "demonstration areas" are located? Will an EA with public involvement be done

16. It is very difficult to compare <u>Bt</u> to Dimilin relative to BIU'S/acre or ounces active ingredient (a.i.)/acre respectively. As indicated, Dimilin is effective against the gypsy moth from 0.5 to 1 oz. a.i./acre. <u>Bt</u> is normally applied at rates of 8 to 20 BIU/acre. Both insecticides can achieve foliage protection when properly applied. Dimilin has proven more effective at reducing high populations. Variable effectiveness occurs with both products at very high population levels.

17. Comment noted. Describing Dimilin as a benzoylphenylurea-based compound would also be more accurate. We have tried to keep terminology simple to increase readability.

18. The 1978 Willcox and Coffey paper is a summary of studies on diflubenzuron. The majority of the studies reviewed were those conducted for registration of diflubenzuron in the United States. Additional references have been added to the EIS and in general, are supportive of the conclusions drawn in the Willcox and Coffey paper.

19. We have revised the discussion of diflubenzuron on II-6 of the DEIS to include the temperature and pH effects mentioned on IV-24 of the DEIS. We have also included as a citation the laboratory study conducted by Ivie, et al (1980). In this laboratory study, diflubenzuron was suspended in deionized glass distilled water pH ~ 6.0 and buffered samples of pH 4.0 and pH 10.0. The study indicates that under laboratory conditions, "diflubenzuron degrades rapidly in neutral or alkaline water and the potential for persistence or accumulation in water only under quite acetic conditions. Because the pH of most natural waters ranges between 6 and 9, the use of diflubenzuron as an insect control agent should not result in persistent residues in environmental waters except in most unusual circumstances". Except where acid mine drainage may occur in the AIPM Project Area, none of the streams are expected to have a pH acid enough for diflubenzuron persistence to occur. The cool water temperature of mountain streams is probably not as important to the breakdown of diflubenzuron as is the pH, organic matter and microbial activity in the waters.

20. The only studies that involve water sampling of clean, fast-moving streams and reviewed during the preparation of this document were: (a) Huber and Collins, 1987., Huber and Manchester, 1988., Jones, 1987. and Edmunds, 1984. Complete references are presented in Chapter IV of this EIS. No indication was made of the amount of suspended organic material in the streams for the studies.

21. In the Mutanen, et al (1988) study, needle samples removed from the lower crown on two plots did have detectible levels of diflubenzuron one year later, but the detected amounts were less than half the amount originally detected on the day of application. Needles removed from the litter layer on one plot did have detectible levels of Dimilin one year later, however, no Dimilin could be detected from the humus layer below the needles on any of the plots. Once the Dimilin enters the litter layer, it is rapidly degraded to non-detectible levels.

22. The Willcox and Coffey statements, with recent additions, are valid in relation to the studies reviewed at that time. None of the recent studies reviewed would require any major changes in the statements

presented by Willcox and Coffey. Using the assumption that the majority of the streams are acidic in the AIPM Project Area, acidic enough to prevent rapid degradation of the diflubenzuron, would mean streams are too acidic to support native trout, other fish and many aquatic insects (see response no. 19 above). Trout cannot survive in waters below pH of 5.5.

Review of the studies cited in response no. 20 of this letter indicates the impacts on aquatic insects in the mountain streams studied and monitored are minimal. In addition, streams identified by State agencies as trout waters will be covered by guidelines for spraying diflubenzuron equivalent to those described for open water (see Chapter II, Mitigating Measures, No. 7).

23. There have not been any long-term (greater than 3-year) studies of the wide-spread use of diflubenzuron or Bt. Due to the short duration of the AIPM Project, we can only evaluate an intervention activity for a maximum of three years (e.g., we are doing this for diflubenzuron at Fernow Experimental Forest).

24. Point well taken. Silvicultural treatments will not be considered as an operational component of the AIPM Project, but AIPM will support research and conduct pilot evaluations of silvicultural treatments. At this time, there is only one area proposed for implementation of the silvicultural options (i.e., West Virginia University Forest) as these options are experimental and we only have 3 years for evaluation. Environmental analyses will be conducted prior to implementation of pilot studies.

53

Smith, page 4

(say yes)? What are the pros and cons, as I understand this approach is quite uneffective, except for harvesting merchantable timber.

12. P. II-7, Effectiveness: It should be made clear that the effectiveness values presented are for each agent alone, not when used <u>together with other tactics</u> in an IPM approach.

25 A distinct advantage of low persistence-high specificity may be seen when the impact on non-target organisms is evaluated, especially in view of dimilin's much broader non-target audience. The order of preference here is undoubtably NPV, Bt, then dimilin. The balancing of benefit and cost, and the declaration of the number of unknowns involved, should be discussed in comparing the 3 tactics, not simply their effectiveness alone against the gypsy moth in which dimilin is the apparent winner.

13. P. II-11, paragraph 1: The first sentence is not complete, but I assume it wants to say dimilin alone could meet the objectives

26 of AIPM. This is an example of why paragraph 4 of item 2 above should be addressed. <u>One major reason for eliminating this alternative should be the broad spectrum of non-target organisms effected by dimilin, and the clear unknown effects of massive, long-term spraying of this chemical insecticide on the ecosystems involved</u>.

27 14. P. II-12: The reasons given for eliminating use of gypsy-moth specific tactics revolve around the statement "efficacy information is lacking." Therefore you do not <u>Know</u> if a combination of these techniques is viable in and of itself, and one of the purposes of the AIPM Project is to test this. To imply that they will only be viable when used with intervention tactics that are not gypsy-moth specific is misleading, and this language should be changed.

28 15. P. II-12: Item (1) should include "nature of aquatic ecosystems" if dimilin is to be considered.

29 16. P. II-13: We support the site-specific analyses <u>if</u> they are done right. It is clear that some of the major players in this game are not particularly interested in careful planning and evaluation of environmental impacts, especially of chemical insecticides. It is important that these analyses be carried out by a team with most members who clearly do care about these things. Who will do, review, and approve the site-specific analyses should be carefully spelled out. This decision-making is even more important than the EIS. How will we be guaranteed that the site-specific analyses will be done right if we consent to this EIS not doing it?

30 The following paragraph refers to the EIS, not to the site-specific analyses. This is somewhat awkward. There should be a (3) explaining how a final alternative will be chosen from the site-specific analysis before returning to the EIS discussion.

17. P. II-13, 29, etc.: I will hold all my comments on Wilderness until after our discussion on December 20.

31 18. P. II-23, top: I do not believe there are any arthropods in the project area that would <u>not</u> be potential targets of diflubenzuron. Thus the word "some" should be omitted as it misleads.

32 19. P. II-24: "Effectiveness" and "application" are different. This EIS should make it very clear that the effectiveness of these treatments using the IPM approach is largely <u>unknown</u> at this time. Use of dimilin may actually be unnecessary! You simply do not know.

25. No mention was made on II-7 OF THE DEIS under Effectiveness to indicate that the values presented were for any type of combination of tactics. We have removed this information because reviewers felt it presented an unfair comparison of the two insecticides. We would agree that if adequate supplies of NPV were available and if it was as effective at high and low populations as <u>Bt</u> and Dimilin, it would be the insecticide of choice. However, we can only anticipate that 3,000-acre equivalents of NPV will be available in 1989 and at most, no more than 6,000 to 8,000-acre equivalents available for 1990. If we were to factor in product and application costs, then Dimilin would be the preferred insecticide. However, since this is a demonstration project, tactic or intervention costs are a minor consideration and the development of environmentally safe and effective approaches to meeting project objectives is of primary importance.

26. This is a correct assumption relative to the first sentence, paragraph 1, page II-11 of the DEIS. The text in Chapter II describing why a "diflubenzuron only" alternative was eliminated has been revised to better explain why it was eliminated. In reference to your paragraph 4 of item 2 in your letter, it is assumed that you feel if an alternative is selected that includes the use of Dimilin or <u>Bt</u>, that the same acreage will require repeated application year after year. This is not the case. Operational experience has shown that if either <u>Bt</u> or Dimilin is properly applied, the area does not require retreatment for several years. Furthermore, it assumes that proven detrimental impacts on nontargets occur from the use of these tactics. Available studies as well as past operational uses do not support this assumption.

27. The language as presented on page II-12 of the DEIS for the gypsy moth-specific tactics is true in light of our current technology and knowledge of how to use the techniques. None of the techniques have proven effective when used by itself within the generally-infested area or on the leading edge of the gypsy moth infestation. Additional developmental work on some of these tactics is planned in 1989 (see Appendix F of the EIS).

28. Comment noted. The words have been included in the text as suggested.

29. The site-specific analyses are the responsibility of the land manager upon which actions are proposed. The appropriate Forest Supervisor will approve decisions on National Forest lands, the Park Superintendent will approve for NPS lands, the Regional Forester (Atlanta, GA) will approve the Commonwealth of Virginia decision and the Area Director of the Northeast Area (Broomall, PA) will approve the State of West Virginia decision. The preparation of an Environmental Assessment, which documents the site-specific analysis, requires public participation in order to develop a significant issues and concerns. You may request from each of the agencies that you be informed during the scoping process, provide issues and concerns, and request final EA's so that you can judge their quality. Language has been added to the "Alternative Considered in Detail" section to clarify this review process.

30. The NEPA process will continue at the Project level. Appropriate NEPA documentation will be prepared based on the site-specific analysis. Public scoping will occur. Alternatives for the project will be developed from the range of options available under the selected alternative in the AIPM EIS. The section to which you refer discusses none of the components of the site-specific analysis which does not include a decision. A project level alternative will be reflected by the appropriate land manager in a decision notice which will contain the rationale for the decision.

31. The section referenced in this comment is a summary and not intended to be a detailed list of effects. Insects, arachnids and crustaceans are all arthropods. Some of these organisms but not all are affected by diflubenzuron because of the way they synthesize chitin. The term arthropod has been replaced by more descriptive terms.

32. The table has been corrected. In many cases the effectiveness of some tactics are unknown. This is one of the objectives of the AIPM Project, to demonstrate the effectiveness or ineffectiveness of some tactics.

53

Smith, page 5

33 20. P. II-26-9, E,T&S: Indirect impacts on those species (e.g. bats) that feed on sensitive non-target organisms should be added. In 2, existing habitats may be improved by gypsy moth tree death, and this possibility should be recognized along with benefits of treatment.

34 Fish & Aquatic Ecosystems: In 3-6, In view of the unknown environmental fate of aquatic dimilin in the project area (see 10 above), omit "limited" and indicate long-term treatment impacts may have permanent effects.

35 Soil: Considering that "soil" is an ecosystem, are there no arthropods (or lepidoptera?) in soil ecosystems, and do you know the effect on the ecosystem if they are removed? It is becoming well established how important the mircroflora activity are to the nutrient state of some (all?) tree species.

36 Water Quality: If diflubenzuron is not rapidly degraded (see 10 above) there could be contamination, even if temporary or washed downstream.

37 Recreation: Last sentence, "methods" should be "effects."

38 Socio-Economic: Timber is not the only consideration, although it is to some of the Key AIPM players. There are social impacts from the negative reaction of the public to massive spraying of Bt and chemical insecticides in our environment whose long-term effects are currently unknown. Private landowners may be socially effected by pressure to treat or not treat, creating the potential for serious conflict as seen elsewhere. There may be impacts on outdoor recreation and wildlife-based forest industries, both negative and positive. In West Virginia, where Travel and Tourism is now the second largest industry, effects plus and minus treatment could be significant, even if short-term.

39 Wetlands: Again, we are talking obout an ecosystem. Do arthropods and lepidoptera play no part in this ecosystem? (See label instructions for diflubenzuron mentioned on page II-35: "...open bodies of water or wetlands...")

40 21. P. II-32: Careful monitoring and further study should clearly be undertaken of E,T&S species rather than relying on "existing" scientific evidence in determining the necessary mitigation measures. Much of that evidence is "unknown" at this time (e.g. bat study ongoing). Therefore, treatments, with Bt and dimilin especially, should be undertaken conservatively, and with caution, while populations are continually monitored. This is a serious concern of ours in view of the "spray now, think and study (if you want) later" attitude of some of the AIPM players.

41 22. P. II-37, Item 7: We can not support the direct, large-scale spraying of diflubenzuron over our streams and rivers even if they are covered with a canopy. Scientific evidence shows dimilin has a long-term persistence on leaf surfaces. Evidence suggests that it can remain until after leaf-fall (see your Mutanen, et. al. reference, p. E-3). I am not aware of any studies showing what would happen to water ecosystems when leaves coated with dimilin fall or are washed into the water. What is the fate of this dimilin, and can it end up in water invertebrates before it is degraded? What effect does the time of year have on arthropod susceptibility, and when is this dimilin finally degraded? Until these unknowns are answered, all permanent streams should have a buffer zone of no dimilin spraying.

42 23. How will areas of Karst topography be protected in terms of direct flow of dimilin into underground waters and caves? (Note the susceptible E.T&S species associated with caves.) There are a number of areas where sink-holes occur within the AIPM project area.

33. A statement on insectivorous ET&S species has been added to the summary of environmental consequences in Chapter II. It should be noted, however, that there is no evidence to suggest that any endangered, threatened or sensitive insectivore feeds exclusively on insects that could be directly affected by treatments proposed by the AIPM Project.

We agree that existing habitats may be improved for some ET&S species by tree mortality. A "no treatment" option (where tree mortality is most likely to occur) is available in all alternatives. The environmental consequences of "no treatment" as it relates to endangered, threatened and sensitive species are discussed in Chapter IV under alternative 1.

34. See Letter No. 4, response no. 1 and this letter, response no. 41 for a discussion of the environmental fate of diflubenzuron.

See Letter No. 25, response no. 4 and Letter No. 63, response no. 3 for discussions of some effects of diflubenzuron.

35. There are arthropods in the soil (humus layer) ecosystem. A number of forest Lepidoptera are often found in the humus layers. Many pupate and over-winter in the soil. A few common examples are the orangestriped oakworm, greenstriped mapleworm and the hickory horned devil. In reviewing the literature, we found no studies involving the insecticides proposed for use in the AIPM Project that revealed any significant impacts on soil microflora or ecosystem at application rates used for gypsy moth suppression. Also, see Letter No. 54, response no. 9 for additional discussion of the effect of Dimilin on soil organisms at very high rates.

36. Field studies available at this time do not support the long persistence of Dimilin in streams or ponds of normally occurring pH (see response to your comment no. 19).

37. Comment noted and corrected.

38. As stated on page I-2, project participation is strictly voluntary in that lands within the project are eligible for intervention tactics without cost to the landowner. The decision on whether to participate or not in the AIPM Program can only be made by that landowner. The landowners must decide for themselves what is best for them.

As stated in Chapter IV, Environmental Consequences, effects on recreation and wildlife have been disclosed. Economic effects related to loss of tourism dollars due to gypsy moth or treatment to control gypsy moth is lacking. There are some studies indicating a reduction of recreational use in heavily infested areas (see response no. 67 in this letter) with no treatment occurring. However, in this case, under the "no action alternative", the existing eradication and suppression program would continue to function. In most cases, existing developed recreational areas as well as high value areas (scenic areas) would be eligible for some type of treatment. As such, it is not expected that any significant impact would occur to other economic bases than those listed in the EIS.

39. Open bodies of water (lakes, ponds, streams or other wetlands) will not be treated with diflubenzuron under the AIPM program (see Mitigating Measures section at end of Chapter II).

40. Mitigating measures for E,T&S species are designed to create a process for site-specific evaluations of effects (see Mitigation Measures for E,T&S in Chapter II). It is premature to conclude that treatments of Bt or diflubenzuron will take place in habitat which supports populations of E,T&S species. The US Fish & Wildlife Service is recognized as the final authority in determining what actions are to be taken when E&T species are involved. When sensitive species are involved, determination of what actions to take will be the result of a cooperative effort between land managers, appropriate State agencies and in some cases, the US Fish & Wildlife Service.

41. Many studies have investigated the persistence of diflubenzuron in the environment (Swift, et al 1988, Mutanen et al 1988, Vandenberg 1986, Sundaram 1986, Ivie 1980, Smucker 1988, Sundaram, et al 1987, Willcox & Coffey 1978, Chapman, et al 1985). It is well known that diflubenzuron adheres tightly to leaf surfaces within hours of application and remains intact for extended periods of time. Periodic rainfalls during the same growing season that diflubenzuron was applied have been observed to produce some "wash-off" of diflubenzuron (Jones and Kochenderfer 1987, Huber 1988) which enter streams. All observed concentration levels in streams dissipated quickly (within hours).

Diflubenzuron residues on falling leaves in autumn were below detectible levels (Jones, 1987). Once diflubenzuron is detached from live leaf surfaces or leaves begin to decompose, the chemical responds predictably to existing environmental conditions. However, Jones (1987) observed diflubenzuron in leaf litter was still present 5 months after application.

Temperature is probably the principle factor in evaluating the fate of diflubenzuron in terms of the time of year. The colder the temperature the slower diflubenzuron degrades.

As indicated in Item 7, Mitigating Measures, Page II-7 of the DEIS all water bodies and streams which are not canopy-covered will be buffered. In addition, canopy-covered streams identified by states as trout waters will be buffered. Careful review of the Huber and Collins (1987) report and the Jones (1987) report mentioned in response no. 20 above provides answers concerning how much Dimilin can be expected to reach small streams under a forest canopy, when leaf expansion is less than 100 percent. The reports also supply information as to the significance of the Dimilin that reaches the streams and what impact it has on the aquatic ecosystem. Also provided is information concerning the amount of Dimilin washed off the foliage during periods of precipitation and its significance. The Huber and Collins (1987) report also discusses the use of Bt-treated buffers along major streams in Dimilin-treated areas. It should be noted these studies involved an eradication project that consisted of a double application of Dimilin (4-oz. total) and Bt over 5,149 acres, with 4,654 acres of Dimilin and 495 acres of Bt.

An additional research need has been added to address concerns about diflubenzuron and its metabolites in aquatic ecosystems and as more and newer information becomes available, mitigation measures designed to protect aquatic ecosystems may be modified.

42. Unless identified through site-specific analysis as affecting habitat occupied by endangered, threatened or sensitive species (table III-3 and III-4, Chapter III), karst areas are considered part of the General Project Area. Karst features and caves associated with endangered, threatened or sensitive species will receive protection necessary to support conservation of species involved. Adequate protection measures for E&T species will be determined through consultation with the US Fish & Wildlife Service as referenced in the Mitigation Measures, Chapter II. Sensitive species associated with caves or other karst features will receive appropriate protection as determined through cooperative efforts of land managers, State agencies and in some cases, the US Fish & Wildlife Service.

53

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43 24. P. III-4, Water: A description of the generally high water quality should be given. Temperature and pH are also important in view of the potential use of dimilin, and this information should be provided. Where in the AIPM area is the soil pH acidic as well?

44 25. P. III-6, Social and Economic Factors: Should not the various components (again, not just timbering; see 20 above) of the forest-based economy be presented here even though subsequently discussed in more detail?

45 26. P. IV-3-16: A good job has been done presenting the important no-action Alternative #1. Surprisingly at first, considering all the attention the gypsy moth is getting, few long-term negative effects are identified outside oak-utilizing industries; the short-term effects are largely unpredictable, except at high population densities in developed recreation areas and around homes and communities; and some significant positive effects could actually occur in terms of habitat diversity which the Forest Service now uses to justify much of their timber program and associated (unnecessary) road building.

46 More discussion should be included about the areas behind the moving front. What has happened in New England, New York and Pennsylvania? How do the environments there compare to the Appalachians, where oak-hickory is a major forest component? How have wildlife fared, especially in areas with severe defoliation? What can be anticipated in a gypsy moth move to a more moderate climate?

47 A handle on potential stream water temperature changes and the associated effects could be gotten by discussing the impact of loss of vegetation along rivers and streams caused by the 1985 Flood. As mentioned on p. IV-10,12, most vegetation along our streams are not preferred food for the gypsy moth, whereas the flood made no selection, so the flood effects would be expected to be a high estimate of moth infestation effects.

48 27. P. IV-18-22: Where does Bt go when it is "removed" from the canopy? How much is washed below by rain? (Refer also to paragraph 1, p. IV-19). How does an Illinois study compare to the Appalachain Mountains, and what does "relatively the same" mean in an unpublished study on bird populations there? If this is the only study we have to go on, then I think we have identified an important research need.

49 What happens to the spores of Bt in the soil? Could this not prolong the persistence of Bt in the environment, especially if large areas are treated?

50 To justify Bt use by saying that the negative effects of Alternative 1 can be decreased is misleading. There are very few definite negative effects identified for no-treatment that we consider serious enough to justify the deleterious effects of Bt on the overall forest ecosystem. And the positive effects, such as increased vegetative diversity, would not be realized. The Socio-Economic effects should discuss all those added in item 20 above, as there is more to this than just timbering.

51 We are very concerned about the cumulative effects of repeated and extensive Bt treatment, as well as its probable immediate deleterious effects on a number of E,T&S species of Lepidoptera, and food chain effects on Lepidoptera-eating species. The use of Bt should be strictly limited to highly sensitive areas such as those for residential and high-density recreation use when gypsy moth specific tactics have clearly been demonstrated to have failed.

52 28. P. IV-23-25: I have mentioned above (item 10) the problems with the diflubenzuron discussion and its dependence on the Willcox and Coffey (and thus

43. As stated in the Introduction on page III-2 of the DEIS, environmental conditions have been broadly grouped. As the discussion on page III-4 of the DEIS states, "numerous rivers and streams flow within the Project Area", is based on fact. Detailed descriptions of overall water quality and soil pH in the Project Area are considered inappropriate for a programmatic EIS. Site-specific analysis at the Project level will consider water quality and soil conditions. See Letter No. 4, response no. 1a for discussion on the fate of diflubenzuron in the environment.

44. See response no. 38 above for a discussion on socio-economic factors.

45. Comment noted.

46. See response no. 14 above for discussion of effects on comparable areas behind the moving front. Pennsylvania has comparable forest types to those in the AIPM Project Area.

Gypsy moth populations can be found in warmer climates than the Appalachians (northern America and California). The most obvious difference in gypsy moth populations in warmer climates are earlier and less synchronized hatching.

There is no readily apparent, long-term wildlife community or population trends that are directly attributable to severe gypsy moth defoliations. As stated in Chapter IV, defoliations contribute to short-term stresses on wildlife populations through periodic disturbances of habitats. Information on how wildlife has "fared" over time however, can only be remotely inferred from annual breeding bird counts, hunter harvest reports or other indices for population trends in a rather broad context.

47. There is no information available that correlates fluctuations of stream temperature to canopy removal as a result of the 1985 flood in West Virginia. There are formulas, however, that are used to predict stream temperature response to complete canopy removal in watersheds. Studies are currently in place in the AIPM Area which will provide information regarding the effects of gypsy moth defoliation on streams.

48. In the discussion of Bt in Chapter II, the effectiveness of this biological insecticide on the target foliage is about 7-10 days. Because Bt is a naturally-occurring product, natural processes will begin to break it down gradually. Bt spores and crystals are subject to natural agents, such as ultraviolet light, foliage growth dilution, weathering and rainfall that gradually reduce its effectiveness. Bt spores and crystals removed by rainfall eventually are deposited on lower branches, tree trunks and the forest litter. The amount of Bt washed from the foliage is dependent upon the amount of rainfall, number of rainfall periods and the type of sticker added to the formulation.

The Illinois study was conducted to determine if Bt applications to control a target defoliator, had major impacts on nontarget Lepidoptera. The study is applicable to the Appalachian Mountains since many of the nontarget Lepidoptera occur in the Appalachian forests.

49. Bt spores and crystals that are washed from forest foliage to the litter and soil surfaces continue to biodegrade. The spores are the most resistant and may persist from several weeks to a few months, depending upon soil type, soil flora and soil factors such as pH, moisture, temperature and solar radiation. A study of soils treated with Bt applied for vegetable pest control concluded that spores can remain viable for long periods (over 3 months) and that the organism can germinate and compete vegetatively in the soil and sporulate successfully under favorable conditions (Saleh, 1969). The crystals are proteinacious and degradation by enzymatic action of soil flora is assumed.

50. Comment noted. See response no. 38.

51. The use of Bt will not eliminate all Lepidoptera from treatment areas. However, some nontarget Lepidopterous insects may be impacted by Bt if they are actively feeding in the treated area within 14 days after application. We share your concern for applications of Bt in critical habitat areas of ET&S Lepidoptera. These concerns will be addressed in site-specific environmental documents.

52. See Letter No. 25, response no. 4 for discussion of some short and long term effects of diflubenzuron on some nontarget species. See Letter No. 4, response no. 1a and this letter, response no. 41 for a discussion of persistence of diflubenzuron in the environment. See response no. 40 in this letter for a discussion of intervention tactics and E,T&S species in the AIPM Project Area.

producer Philips-Duphar) paper. The numerous non-target organisms effected, including a number of E,T&S species, the persistence of dimilin in the environment (not the "rapid degradation" indicated by Willcox and Coffey), and the unknown short and long-term effects of massive spraying are weighed, again, against questionably significant benefits.

53 The statements about diflubenzuron need to be corrected here as on p. II-6. I find most misleading the statement on p. IV-24, "the persistence of diflubenzuron in water ..... is generally short term with a half life of less than 24 hours .....," and yet they admit this is a function of microbial activity, pH, temperature, and suspended organic matter. Under what exact conditions was the half-life under 24 hours, and how does this compare to the AIPM waters? In the case of our "generally" acidic, cold, clear, fast-flowing mountain streams found in much of the AIPM area, this 24-hour figure means absolutely nothing. Where are the studies that are applicable to the AIPM area? More unknown effects, I predict.

54 Considering as well the much larger non-target audience for diflubenzuron than for Bt, our concerns over wide-spread dimilin use are greatly multiplied over those for Bt.

55 29. P. IV-30, paragraph 5: List the laws that govern management of National Park Service lands as you did for Forest Service lands.

56 Paragraph 6: I do not believe the statement that potential long-term effects on soil, water, wildlife, T&E Species, and visual quality can be mitigated is an accurate one. You do not know what the effects of repeated use of Bt or especially dimilin will be, and their negative effects on non-target organisms are highly probable.

57 Paragraph 7: If monitoring discloses that mitigation measures are inadequate, one of the "new ones" that should be strongly considered is immediate discontinuation of that particular treatment, and this should be mentioned as a distinct possibiltiy.

58 Paragraph 8: You again only refer to the timber production use of the forests. The negative effects of non-gypsy-moth-specific tactics also may well effect long-term productivity in terms of non-target organisms, wildlife food chains, biodiversity, etc.

59 30. P. IV-31, paragraphs 2 and 3: Again, no mention is made of the potential long-term effects of Bt and dimilin on the forest ecosystem.

60 Paragaph 7: It is mentioned that treatment "will help maintain stable timber markets." It should be made clear and up front what would happen if treatment begins, and is then discontinued after 5 years. The preference then may be Alternative 1, whose long term effects are predicted to be minimal (or positive!) except for oak-based industries.

61 31. I do not believe there is a procedure included for revising the Final Alternative if need be in the future. Should this not be added as an important component to allow better decisions to be made as research addresses the current unknowns?

62 32. P. IV-32-33: Discussion must be included about the potential irreversible or irretrievable commitments of resources due to use of non-gypsy-moth-specific tactics. This is not at all a balanced discussion. P. IV-33, paragraph 3 should read "...potential irretrievable..."

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53. See response to nos. 19 and 41.

54. Comment noted.

55. Noted. Additions have been made to text.

56. Mitigation is a broad term that represents actions that avoid, reduce or compensate for an impact on resources and/or the human environment. At the least, mitigation includes:

a. Avoiding the impact altogether by not taking a certain action or parts of an action;

b. Minimizing impacts by limiting the degree of magnitude of the action and its implementation;

c. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.

d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;

e. Compensating for the impact by replacing or providing substitute resources or environments.

We believe that with mitigating measures (Chapter II), the potential for adverse effects on soil, water, wildlife, E&T species and visual quality can be eliminated (paragraph 6, page IV-30 of the DEIS). In addition, the next paragraph in that same section describes what course of action is to be taken when mitigation measures are found to be inadequate.

57. We agree and have added language to that effect.

58. Under the no action alternative, biodiversity for most plant and animal species will likely increase as indicated in the discussions presented on IV-4, 5, 6 and 7. The analysis in Chapter IV and a review of the current literature did not surface any significant effects on the long-term productivity of the resources you mention.

59. See response nos. 40, 48, 51 and 65 regarding Bt impacts on ET&S, nontarget Lepidoptera and Bt persistence. Studies are being set up to provide this information.

60. "Treatment" here refers to treatment under the AIPM Project. AIPM is a special project that is in addition to the normal Federal/State cooperative suppression programs. These programs will remain in effect in areas outside of AIPM and take effect in the AIPM area once the AIPM Project is complete. While treatment under AIPM will be discontinued at some future time, the opportunity to continue treatments under cooperative suppression programs will exist.

61. A supplement can be made to an environmental document when substantial changes are made in the proposed action that are relevant to environmental concerns or when there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. The standards of 40 CFR 1502.9 governing the correction, revision or supplementing of environmental documents will apply. Essentially 40 CFR 1502.9 says that agencies shall prepare, circulate and file the supplements in the same fashion as a draft and final EIS. This information will be included in the Record of Decision for this EIS.

62. As stated on pages IV-32 - 33 in the DEIS, there are no known irreversible or irretrievable commitments of resources at the program level. Possible commitments of resources that could occur are presented in the action and no action scenarios in response to the alternatives considered. The commitments of resources that will occur once a site-specific project has been identified will be discussed in the site-specific NEPA documentation.

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63 33. P. IV-34: Should mention the possible negative effects on our aquatic ecosystems from dimilin.

34. P. IV-35: Research needs that should be added are:

64 - 12. Determine the persistence of Bt and diflubenzuron in Appalachian forests.

65 - 13. Determine the fate of Bt spores in the Appalachian forest environment.

66 - 14. Determine the persistence and effects of dimilin on aquatic ecosystems of Appalachian forests.

67 - 15. Evaluate the perceptions of forest recreation users on gypsy moth treatment/no treatment in applicable areas.

68 - 16. Evaluate the overall effects on timber, recreation and other forest-based industries in areas where the front has passed, both recent and long-term.

69 35. Appendix A: I am not certain who wrote the descriptions of the Monongahela National Forest Wilderness Areas, but the wording is unenthusiastic at best. For example, one of the most outstanding features of Dolly Sods is the northern-tundra type of vegetation seen at the high elevations, some of the highest in the Appalachians. No mention is made of the high country bogs with their unique vegetation (cotton grass, pitcher plants, sundews, etc.). The beaver activity on Breathed Mountain is notable, and is now in the process of creating a new high country bog. Anyone who would say that the scenic values are "average" has not hiked Red Creek, Rocky Point or Rohrbaugh Plains Trails. And the wild blueberries are outstanding.

70 Big Beechy Falls is one of the distinctive features of Cranberry Wilderness, as well as its high elevation and use for cross-country skiing. Trout fishing is big business there. Beaver activity has a very notable presence along the Laurel Fork. From the definition of "primitive recreation" on p. VII-9, I certainly would not say that the opportunities in our most WV Wilderness Areas are low!

71 36. P. E-1, paragraph 1: Define what is meant by "relative safety." These publications have not removed our skepticism about dimilin use. Several, in fact, increase it.

REFERENCES USED ABOVE

Ivie, G.W., Bull, D.L., and Veech, J.A. J. Agric. Food Chem. 28, 330-337 (1980)

Mansager, E.R., Still, G.G., and Frear, D.S., Pest. Biochem. Physiol. 12, 172-182 (1979)

Martinat, P.J., Christman, V., Cooper, R.J., Dodge, K.M., Whitmore, R.C., Booth, G., and Seidel, G., Bull. Environ. Contam. Toxicol. 39, 142-149 (1987)

Nigg, H.N., Cannizaro, R.D., and Stamper, J.H., Bull. Environ. Contam. Toxicol. 36, 833-838 (1986)

Again, Dave, we appreciate the opportunity to have input into the Final Alternative and EIS for the AIPM Project. I also appreciate the effort you are making to carefully evaluate the Wilderness issue. You can always call me if you have any questions on my comments. Thank you for considering them.

63. Good point. The section on probable adverse environmental effects that cannot be avoided has been expanded to incorporate this comment.

64. AIPM is funding Alice Jones (USFS, Southeast Forest Experiment Station) to determine residue levels and persistence of diflubenzuron on bark, twigs, leaves and ground litter. Bt spores are naturally found in the soil. Other studies are being funded in 1989 include one with WVU to develop and/or improve methodology to quantify diflubenzuron amounts found in bark, twig and litter samples and one with Marshall University to determine nontarget effects. These are in addition to the work funded through Alice Jones.

65. Bt spores are found naturally in the soil, although when aerially applied, they do persist on the foliage, in bark crevices, etc. There are numerous studies documenting endospore persistence although without additional efficacy to the target insect. (See response nos. 48 and 49).

66. AIPM is funding a 3-year study to determine the potential effects of diflubenzuron on selected aquatics. This study will be conducted on three watersheds within the Fernow Experimental Forest and includes cooperators from the US Fish & Wildlife Service, West Virginia University Department of Forestry, Marshall University, Fairmont State College and US Forest Service.

67. Similar studies such as the one proposed have been undertaken in the past. In 1986, the Allegheny National Forest in Pennsylvania incurred heavy gypsy moth defoliation. A gypsy moth and recreational experience survey was conducted to evaluate the perceptions of forest users. Written and verbal responses (numbered in the hundreds) were registered with the predominant feeling by recreationists that the quality of the desired recreational experience was seriously reduced. Aesthetic loss and the displeasure associated with frass droppings and the heavy numbers of caterpillars crawling over facilities and on users were frequently cited. In 1977, an analysis of the gypsy moth and its impacts on homeowners and managers of recreation areas in New York and Pennsylvania was conducted (Moeller, G.H.; Marler, R. L.; McCray, R.E.; White, W. B. 1977). For all ownership groups, it was demonstrated that their objectives were seriously affected by gypsy moth outbreaks and its related impacts. Public recreation areas that were impacted lost an average of 36,300 person days and 240 days of recreation use. A mail survey of cottage owners and commercial resort owners in Southern Ontario indicated that the majority (53%) would experience reduced recreational usage from a large infestation of caterpillars (Roden, D. B.; Surgeoner, G. A. 1986).

68. These studies have not been conducted across a broad geographic area but as isolated studies with varying results. The AIPM Project is not proposing to fund these studies due to the limited duration of the Project.

69. Additional text added to the EIS to further describe the scenic values of Dolly Sods Wilderness.

70. Additional dispersed recreational activities have been added to the EIS text for the Cranberry Wilderness description.

The second sentence of the definition of primitive recreation states in part that "the site is of a size or remoteness to offer isolation from the sights and sounds of humans". Due to the high potential for interaction with other people in wilderness on the Monongahela National Forest, opportunities for primitive recreation are low.

71. The words "relative safety" were used in relation to human safety. See also the response to Letter No. 55, response no. 9.

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Sincerely,

Mary Wimmer

Mary Wimmer
Conservation Committee Chair

cc: Allan Bullard
Richard Reardon
WV Congressional Delegation
Jim Pierce
Ed Clark
Barry Flamm

54

19 DEC 1988

National Coalition Against the Misuse of Pesticides

530 7th Street, SE • Washington, DC 20003 • 202/543-5450

December 16, 1988

David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Smith:

This letter communicates the comments of the National Coalition Against the Misuse of Pesticides (NCAMP) on the Draft Environmental Impact Statement, "Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project." As the only national public interest organization focused exclusively on pesticide issues, NCAMP will no doubt be involved in working with citizens affected by pesticide applications that come about as a result of this program. We have been strongly involved in this capacity in the state gypsy moth suppression programs occurring now in Maryland and Virginia.

1 First, we support alternative 2 - the use of gypsy moth-specific and biological tactics where needed to maintain gypsy moth populations at non-defoliating levels in the General Project Area only. We do not support the use of diflubenzuron in the AIPM Project because of our concerns over the human and environmental risks of this chemical. Because of the fact that the gypsy moth cannot under any circumstances be permanently excluded from wilderness areas, and because of the intrusive nature of effective intervention tactics, we do not support any actions in these areas.

Many of the hazards posed by the use of diflubenzuron are presented throughout the DEIS. However, there are a number of instances in which information is given that we feel is not truly representative of that which is available in the scientific literature. Specific instances are as follows:

2 **Page II-6. Fate in the Environment.** The DEIS reports that diflubenzuron persists in the soil for 3-4 days and has a half life of less that 24 hours in water. In fact, the persistence of diflubenzuron is known to be highly dependent on pH, temperature, and substrate particle size (EPA, 1979). Ivie et al. (1980) state that diflubenzuron persisted for at least 56 days in water at a pH of 4.0, and Bull and Ivie (1978) found that it persisted for 9 months in the soil of cotton fields. Samples of leaf litter taken after treatments for gypsy moths still contained diflubenzuron after 5 months (Jones and Kochenderfer, 1987) and 9 months (Smucker, 1987). Given the lack of information in the DEIS on the pH, sediment particle size, and expected water and soil temperatures in the treatment areas, it seems doubtful that persistence values can be derived or even guessed. It also would seem to indicate that more conservative persistence values should be used in calculating risk.

Response to Comments in Letter No. 54

From: Kevin Thorpe, National Coalition Against the Misuse of Pesticides

Comment No.	Response
1.	Comment noted.
2.	Additional information has been added to Chapter II under the Description of Intervention Tactics Considered in alternatives section regarding the fate of diflubenzuron in the environment. Also see response to Comment Nos. 19 and 22 of Letter No. 53. The persistence of Dimilin in cotton fields is not comparable to forest use, since up to 6 applications may be applied for cotton boll weevil control per year and only 1 application of Dimilin per year for gypsy moth control. In addition, the application rate for Dimilin on cotton is higher than the rates used for gypsy moth control.

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3 **Page II-36. Sensitive Species. #4.** We strongly support allowing private property owners or managers to abstain from the spray program if they so desire. We feel that the language should be changed to include residents that are not themselves property owners, such as tenants and caretakers.

4 **Page II-37. Sensitive Species. #7.** There are a number of problems with this mitigating measure. First, a 200-foot buffer is not adequate to prevent drift onto open bodies of water. With aerial applications, significant amounts of drift are expected to occur over 1000 feet from the target area (von Rumker et al., 1975).
5 Second, the prohibition of direct spraying over open bodies of water alone is not sufficient, since pesticides can be transported with surface water. This requirement alone will still allow spraying over the extensive watershed areas which recharge the bodies of water of concern. Third, the conventional definition of "closed canopy," over which spraying would be permitted, includes waters which are not sufficiently protected by canopy to prevent contamination.
6 Jones and Kochenderfer (1987) determined that up to 52% of the theoretical applied rate was reaching the surface water of streams which they sampled during an application for gypsy moths. They noted that these streams met the diflubenzuron label requirements for "open" canopy. Furthermore, even if the canopy does succeed in intercepting all of the spray, it would continue to wash into the streams after rainfall events. Jones and Kochenderfer (1987) found up to 10 times higher levels of diflubenzuron in streams after rainfall events than those that occurred during the initial spray.

7 **Page IV-23. Insects.** The DEIS cites the paper by Martinat et al. (1988) as finding no significant treatment effects for 9 groups of terrestrial Arthropods (herbivorous Hemiptera, Homoptera, Pentatomidae, Phymatidae, Reduviidae, Salticidae, Clubionidae, Dictynidae, and herbivorous Condylognatha). While it is not clear from the narrative in the DEIS, these groups were not tested individually, but rather were lumped together in a single large group. Therefore it is possible that individual groups were adversely affected, but that the analysis was not able to detect it.

8 **Page II-24. Fish and Aquatic Ecosystems.** The DEIS states that diflubenzuron does not accumulate in fish. However, Apperson et al. (1978) reported finding 355 ppb residues in white crappie from a lake treated with 5 ppb diflubenzuron. Booth et al. (1976) found that after 20 days the diflubenzuron was gone from rainbow trout and bluegill, but that the suspected carcinogenic breakdown product, 4-chloroaniline, was present.

9 **Page II-24. Soil.** There is no discussion of the potential effects of diflubenzuron on soil organisms. Given the wide diversity of organisms that secrete chitinous exoskeletons, the abundance of these organisms in forest soil, and the lack of mitigative procedures to prevent chemicals from reaching the soil, it seems to us that this should be a serious concern.

3. We do not feel the change is needed. The property owner has the right to protect his resource and related property values.

4. The 200-foot buffer is a minimum. On-site conditions, type of aircraft, etc., may necessitate the establishment of a wider buffer. Monitoring of spray will occur on site and the buffer will be adjusted as needed during treatment to insure that drift to open bodies of water is minimized. See Letter No. 53, response nos. 20 and 41. The studies listed do not support the need for a 1,000 foot buffer.

5. Surface runoff that may transport residual amounts of Dimilin will expose the insecticide to significant amounts of organic material and microbial activity that will rapidly degrade the material.

6. Findings similar to the Jones and Kochenderfer (1987) report are presented in the Huber and Collins 1987 report and the Jones (1987) reports cited in response to comment no. 20, Letter No. 53. Both studies involved a gypsy moth eradication project on the Tusquitee Ranger District, Nantahala National Forest in North Carolina, and involved two applications of Dimilin or Bt. It was concluded that because of the levels of Dimilin detected and the short period of time it persists in the streams, that the spray program did not have an adverse impact on water quality. This was further supported by the invertebrate data. For more discussion on canopy cover and aerial spraying of diflubenzuron, see Letter No. 63, response no. 3.

7. The language on effects of diflubenzuron on insects has been modified to incorporate this comment. (See Chapter IV, Effects of Alternative 3 on Insects).

8. In the context of the subject being addressed in the DEIS on page IV-24, accumulation of diflubenzuron by fish meant stockpiling and retaining the chemical in the body. This is not known to occur. Apperson (1978) observed that residues of diflubenzuron did not remain at high levels and by 14 days post treatment, had begin to decline rapidly. Other studies (Colwell and Schaefer 1980, Schaefer et al 1979, Booth 1976) observed similar trends of the fate of diflubenzuron in fish. The discussion on effects of implementing alternative 3 on fish and aquatic ecosystems in Chapter IV has been expanded to provide more information on the subject identified in this comment.

9. Technical Information Bulletin, 9TH Edition by Duphar B.V. states the following: "Field experiments on soil organisms showed that diflubenzuron, administered at the excessively high rate of 2.24 Kg a.i./hectare, caused no observable effects on earthworms, mites, millipedes and centipedes. Populations of springtails decreased, but the effects had largely disappeared within four months. Breakdown of organic matter was not affected." Also, "The impact of Dimilin on components of forest ecosystems was studied in different types of forests. Springtails and mites in soil were incidentally affected, but whenever populations showed a decrease in numbers, the populations were restored for the greater part within 60 days." However, it is unknown if these statements are applicable to soils and soil organisms in the Project Area. This information has been added to Chapter IV, Effects of Alternative 3 on Soil, and under the discussion in the Diflubenzuron Section, Fate in the Environment in Chapter II.

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David Smith
December 16, 1988
Page Three

10 **Page II-25. Public Health.** The DEIS relies on the 1985 FEIS, "Gypsy Moth Suppression and Eradication Projects," for an analysis of the health risks associated with the use of diflubenzuron. However, the U.S. Environmental Protection Agency is currently reviewing new data on the carcinogenicity of the diflubenzuron breakdown product, 4-chloroaniline (personal communication, Phil Hutton, diflubenzuron Product Manager, EPA). If these data are accepted by EPA, a new cancer risk analysis will have to be performed. If the data are still not available prior to writing the FEIS, then this still needs to be investigated and discussed.

11 **Page IV-26. Table IV-2.** The LD_{50} value reported in this table is for diflubenzuron, not Dimilin™, which is the product which will be used in the program. Dimilin, in addition to diflubenzuron, contains "inert" ingredients, the actual identity of which remain undisclosed because they are considered to be proprietary information and are thus protected by law. Many of these inert ingredients are inadequately tested, and in some cases are more toxic than the active ingredient. An example of this is the formulation Roundup™, which contains a surfactant that makes it three times more acutely toxic to humans than its active ingredient, glyphosate, alone (Grossbard and Atkinson, 1985). For this reason, and because the LD_{50} is only one of many kinds of toxicity that must be considered when assessing risk, we feel that tables such as these are misleading to the general public, and recommend that this one be removed from the DEIS.

Thank you for considering our comments. We are excited by the opportunities offered by this project to advance the knowledge of environmentally and sociologically sound gypsy moth management, and hope that the FEIS will permit these opportunities to be exploited to the fullest. We hope and trust that you will continue to seek, accept, and consider public comment even after the program has been implemented.

Sincerely,

Kevin Thorpe, Ph.D.
Staff Entomologist

10. EPA is reviewing a new carcinogenicity study to replace the one on which the current risk analysis is based which was determined to be inconclusive. The reason it was determined as inconclusive was that the treatment group had a lower incidence of cancer than did the control. However, in the 1985 EIS, a worst case assumption was made that 4-chloroaniline did cause cancer. If new data is accepted by EPA and a new risk analysis is done, the analysis would show that the risk for 4-chloroaniline is less than what is currently used for the risk analysis in Appendix C.

11. In 1987, the Forest Service conducted a review of all pesticides which were commonly used by the agency to evaluate the concern of inert ingredients you have addressed here. The Forest Service requested that the manufacturer review a list, developed by EPA, of inert ingredients that were of toxicological concern. None of these ingredients are found in the formulated product, DIMILIN 25W (Letter from UNIROYAL, dated March 31, 1987 [on file]). Table IV-2 is not presented to mislead the public but to show the LD_{50} of diflubenzuron in relation to common products for which the public is familiar.

David Smith
December 16, 1988
Page Four

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19 DEC 1988

55

AUDUBON NATURALIST SOCIETY
OF THE CENTRAL ATLANTIC STATES, INC.

Founded May 18, 1897

CONSERVATION
ENVIRONMENTAL EDUCATION
NATURAL SCIENCE STUDIES

December 16, 1988

David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Rd., N.W.
Atlanta, GA 30367

Dear Mr. Smith:

The Audubon Naturalist Society appreciates the opportunity to comment on the Appalachian Integrated Pest Management (AIPM) Draft Environmental Impact Statement.

1 One basic problem we have with the DEIS is the lack of a clear statement of goals for the AIPM program. Our position is that forest resource protection (i.e. foliage protection) can be achieved with a well designed combination of no-action, gypsy moth-specific tactics and biological tactics. We do not have a position against all Dimilin use. But, because the DEIS has made decisions on thresholds dependent on site specific analysis, we cannot support the USDA Forest Service preferred alternative (5). Instead, we support Alternative 2.

2 We would like to know how many site specific analyses and documentations will be prepared and how USDA will be scheduling public comment on each. (page 1.)

3 Another concern with the DEIS is that it fails to quantify the amount of defoliation directly attributable to the gypsy moth compared to other defoliators (forest tent caterpillars, the looper complex, etc.). No mechanism is established for long term monitoring to determine the relative damage from other pests.

4 Further, the DEIS preferred plan has no specific definitions of injury levels. One key component of an integrated pest management program is the use of defined injury levels before the selection of a treatment and its application. What assurances are there in the DEIS preferred plan that a treatment program will be initiated only when a maximum tolerable injury level has been reached? What research is used to justify a correlation between the types of data to be collected, listed on page II-2, and injury levels?

8940 Jones Mill Road • Chevy Chase, MD 20815 • Headquarters Telephone: 301-652-9188
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Response to Comments in Letter No. 55

From: Neal Fitzpatrick, Audubon Naturalist Society of the Central Atlantic States

Comment No.	Response
1.	Comment noted.
2.	The actual number of site-specific analyses and further NEPA documentation is unknown at this time. Each land managing agency will (based on survey and monitoring of gypsy moth populations) determine if intervention is appropriate within AIPM project guidelines. At present, if action was being considered, lands managed by each major land-managing agency within the AIPM Project area, there would be 7 environmental documents prepared annually for public comment. If intervention activities are warranted, these site-specific analyses will incorporate public participation as required by NEPA. Each land-managing agency will be responsible for its own public participation process. See response to Letter No. 15, Comment no. 6 for information on the public involvement process.
3.	The gypsy moth defoliation data presented in Table I-1 is based on information collected by State and Federal agencies from aerial surveys and ground checks of defoliated areas. The only similar data available on a defoliator is spruce budworm defoliation. Similar information on most hardwood defoliators is not available. Some State agencies do collect information of this type, while other States do not. In addition most native hardwood defoliators, such as the forest tent caterpillar are cyclic and may build to defoliating levels in a given area and remain at high levels for several years and then collapse. Often they do not again reach high defoliating levels for long periods of time and may or may not occur in previously defoliated areas. At times, these cyclic outbreaks may kill considerable amounts of timber. Monitoring the defoliation and damage of native insects as suggested is beyond the scope of the AIPM Project, but the USDA Forest Service prepares an "Annual Conditions Report" which summarizes pest activity nationally.
4.	Since the major goals of the AIPM Demonstration Project is to slow the spread and reduce adverse effects of the gypsy moth, intervention tactics discussed in the various alternatives are primarily keyed to gypsy moth population levels (moth trap data and egg mass data) rather than predicted injury levels. In fact, some of the intervention techniques proposed for use are only effective at very low population levels, far below damage or injury levels. The list of data to be collected as mentioned on page II-2 of the DEIS, is not intended to be all inclusive, but illustrates the type of information needed as recommended by the Technical Committee.

55

David P. Smith
AIPM EIS Team
December 16, 1988
Page 2

5 We are concerned about the impact of Dimlin on water bodies and wetlands. How will wetlands and water bodies be marked off prior to spraying? How will vernal ponds, often critical habitat to aquatic insects but small and difficult to identify without extensive field investigation, be protected from Dimilin?

6 Will buffer zones be considered to address the problem of aerial drift of Dimilin? Does research show they are effective in protecting sensitive areas?

7 Were all the recent studies listed in Appendix E conducted on steep slopes similar to the Jones and Lochenderfer Study in 1986? The average grade of slope reported on in this research was 40%. Were studies looking at the fate of Dimilin in a headwater system conducted on more gradual slopes?

8 Did the Kingsbury, et al. study look at food chain impacts during the three month period after treatment and especially relate them to the most impacted populations, crustacean zooplankton? Were considerations given to bird populations feeding at ground or understory levels?

9 Finally, our organization is concerned about the interpretation of recent research studies that "support the relative safety of diflubenzeron when applied at registered rates to the forest environment." (page E-1) The U.S. General Accounting Office April 1986 Report entitled Nonagricultural Pesticides declares such statements as false and misleading.

"EPA's labeling prohibitions are based on its repeatedly stated position that no pesticide is "safe" because pesticides are, by their very nature, designed to be biologically active and kill various organisms." (page 35).

We ask you to take a careful look at the issues we have raised and we thank you again for this opportunity to participate in public comment.

Sincerely,

Neal Fitzpatrick

Neal Fitzpatrick
Conservation/Environmental
Education Coordinator

5. Wetlands and open water (lakes, ponds and streams) that occur in a proposed treatment area will be identified on appropriate maps or aerial photographs for use by field crews and aerial application personnel. Verification of the accuracy of such maps will be confirmed by on-site visits. As indicated in the DEIS, Chapter II-37, item 7, (Mitigation Measures) buffer zones will be established around or adjacent to such areas. However, on-site inspection of unusual topography or other considerations may require expansion of the buffer zones to further minimize potential drift.

Vernal ponds (spring seeps or puddles), as indicated in your letter, are difficult to locate and will create difficulties in buffering and may receive treatment.

6. As indicated in the response to no. 5, appropriate buffer zones will be established as needed to mitigate the drift of diflubenzuron into open water bodies or as indicated in the DEIS, Chapter II-36, item 5 around no treatment zones for all insecticides. Research has shown that if insecticides are applied under proper meterological conditions and with appropriate buffers, insecticide drift into nontarget areas can be eliminated or greatly minimized. Monitoring of nontarget areas during treatment operations will confirm the effectiveness of established mitigation measures. If monitoring reveals drift into the nontarget areas, treatment will be halted immediately and adjustments in buffer zones or other parameters made to remedy the problem.

7. In reviewing the studies, it appears that some were conducted in relatively flat terrain (Sundaram, et al 1987, Mutanen, et al 1988) while the remaining studies were probably conducted in rolling or mountainous terrain.

8. Assessing impacts on the "food chain" during the three-month treatment was not presented as one of the objectives of the Kingsbury study per se. Residues of diflubenzuron in the physical environment, fish and plants, and biological effects of the chemical on selected species (gennera) were investigated. Effects on the "food chain" can only be inferred from the discussion provided by Kingsbury on waters receiving direct applications of diflubenzuron. Zooplankton populations were dramatically affected with rotifers displaying sharp increases in numbers. Daphnia (cladocera) virtually disappeared from treated ponds, but all populations of adversely affected organisms were well established three months after treatment.

Insect-eating birds are a logical group of species to investigate when evaluating effects of insecticide applications. DeReede (1982) found that diflubenzuron had no significant effect on reproduction or nestling growth of insect-eating birds (tits and sparrows). Several publications (Willcox & Coffey 1978, Duphar T.I. 9th edition, Martinat et al 1986) discuss effects of diflubenzuron on songbirds. In general, fluctuations in populations of insect-eating songbirds seem to be the result of foraging strategies when diflubenzuron is applied. Some birds look for higher densities of gypsy moth larvae (and possibly other larvae) and do not concentrate in diflubenzuron-treated areas.

9. This document has tried to maintain a high degree of readability and uses terms that are easily understood. The word safety refers to the fact that when diflubenzuron is used at the recommended rate it does not cause damage or injury to the human environment. The word safe, cited from the GAO report, is a label restriction which the Forest Service supports. The safe use of all insecticides is of the greatest concern to the organization.

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20 DEC 1988

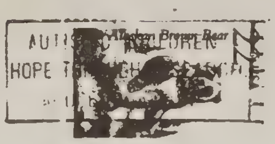
MR. SMITH,

1 Thank you for the October 1988 booklet on the AIPM Project and the EIS on Gypsy Moths.

It answered my concern of why Parasite/Predator and Sterility options couldn't be used exclusively.

Congratulations on such a thorough Draft.

Tom Drummond, 126 Green Oak
Huntington, WV 25705



To:

DAVID P. SMITH
AIPM EIS Team
Suite 718N
1720 Peachtree Road NW
ATLANTA, GA
30367

WILD, WONDERFUL WEST VIRGINIA

Clockwise from top left: Seneca Rocks; Pearl S. Buck Birthplace, Hillsboro; New River; The Greenbrier, White Sulphur Springs; New River Gorge Bridge; Germany Valley; Simpson Creek Covered Bridge, Clarksburg; State Capitol, Charleston. Center: Mountain Sunset

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Response to Comments in Letter No. 56

From: Tom Drummond

Comment No.	Response
1.	Comment noted.

20 DEC 1988

57

Westvāco

December 16, 1988

Mr. David P. Smith
AIPM EIS Team
Suite 713N
1720 Peachtree Rd., N.W.
Atlanta, GA 30367

Dear Mr. Smith:

I have reviewed the draft version of the AIPM EIS, and I offer the following comments.

1 Regarding Program Alternatives, I support Alternative #6 which proposes using the full range of control tactics, including diflubenzuron application, throughout the entire AIPM Project Area. Wilderness areas contained within Project Area boundaries should be evaluated and treated in the same manner as other land uses. I support this alternative because:

2 1) Diflubenzuron application has been shown to be far superior to other proposed tactics.

3 2) Treated areas become susceptible to re-invasion when treatments are discontinued. If effective treatments are not applied in wilderness areas, they will become breeding havens for gypsy moths and serve as infection sources, allowing moths to quickly re-invade surrounding territories. The duration of AIPM Project effectiveness would be reduced considerably if wilderness areas are not treated with the best methods available.

4 Regarding Program participation, I do not support making participation voluntary at the landowner's discretion. Gypsy moth infestation should be regarded as the biological equivalent to wildfire. It is not necessary to obtain permission from landowners to initiate suppression activities on wildfires. Wildfire is recognized as a menace which extends beyond the boundaries of individual ownerships, threatening the welfare of adjoining properties and the public at large. The gypsy moth represents the same type of threat. Allowing patches of infested land to go untreated is equivalent to leaving part of a fire burning, knowing it will inevitably build up again and require further suppression efforts.

5 My overall impression is that AIPM Project objectives are too limited. The Project should be viewed as an opportunity to determine the scope of our abilities to combat the gypsy moth and limit the adverse effects of gypsy moth epidemics. As proposed, the Project appears to be taking a middle-of-the-road approach. There is little difference, other than funding sources, between actions proposed in the EIS and actions which have already been utilized by the private sector and federal, state, and local governments.

Timberlands Division
Appalachian Woodlands
Box 577
Rupert, WV 25984
Telephone 304 392 6373

Response to Comments in Letter No. 57

From: James E. Grobowski, Technical Superintendent, Westvaco

Comment No.	Response
1.	Comment noted.
2.	In general, diflubenzuron provides more consistent population reduction than Bt and Gypchek. There have not been any studies documenting those gypsy moth population densities where diflubenzuron will consistently out-perform Bt or Gypchek. The success or failure of intervention activities depends to a great extent on population trend and quality, and quality of the application. The AIPM Project is committed to apply the most efficacious material with the least potential environmental impact.
3.	See response to Letter No. 8, comment no. 4 for a discussion of wilderness as havens for gypsy moth.
4.	Eradication of the gypsy moth from all or portions of the AIPM Project is not a goal of the Project, nor does the USDA Forest Service have regulatory authority to force landowners to participate in the Project. In addition, while some landowners may object to one intervention tactic, they may agree to participate if other tactics are used. In any event, every effort possible will be made to protect resources on adjacent landowners, and confine the gypsy moth on the land that remains untreated.
5.	The intent of AIPM is to "fill the gap" in our knowledge of how to slow the spread of the pest and limit its adverse effects. As pointed out in the "Need" Section (pages I-3 and 4 of the DEIS), the Forest Service, APHIS and the cooperating states already address suppression of damaging populations and eradication of isolated infestations under their existing programs. AIPM was established to determine what our capabilities are for dealing with all population levels.

6 The Project is being conducted on a demonstration basis to show the results it is possible to achieve with integrated control techniques. Let's not stop halfway. Let's see what can be achieved with an aggressive, all-out attack.

I appreciate having the opportunity to make these comments. I hope you will find them useful in your assessment.

Sincerely yours,

James E. Grobowski

James E. Grobowski
Technical Superintendent

6. The policy of the USDA and the Forest Service is the use of integrated pest management in dealing with pest situations. An "all-out attack" against a pest is accomplished by using available management tactics as they are applicable to specific situations. It includes action against all population densities of the pest to achieve a desired objective (slowing the spread; preventing damage; etc.). No one tactic is applicable to all situations. While one tactic might be more effective than others in killing gypsy moths, it might cause totally unacceptable impacts to other components of the ecosystem when used in certain areas. IPM encompasses a "holistic" approach to the problem--using the right tool for the right job. Knowledge gained through AIPM will allow us to more effectively mount an "all-out attack" against the gypsy moth.

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20 DEC 1988

15 Greenbrier Drive
Buckhannon, WV 26201
December 14, 1988

Mr. David P. Smith
AIPM EIS Team
Suite 718N 1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Smith:

We are writing in answer to your request for comments on the Draft Environmental Impact Statement for the Appalachian Integrated Pest Management Gypsy Moth Demostration Project.

We find that all the alternatives have something we object to, so it was to make a choice. We chose alternative two (pg. II 15) although we

1 object to the use of Bacillus thuringiensis or any other method affecting other organisms, humans, or the environment. We would prefer that only gypsy moth specific tactics such as NPV be used.

We fell that BT and diflubenzuron should be used only in extreme circumstances since

2 they are harmful to organisms other than the gypsy moth.

We would hope that the production of

3 NPV will be increased.

Response to Comments in Letter No. 58

From: Del & Barbara Gillespie

Comment No.	Response
1.	Comment noted.
2.	The selection of an alternative allowing use of Bt or diflubenzuron will be made by the responsible official in the Record of Decision. A site-specific analysis and NEPA documentation is required before any action occurs. In general, the least impacting intervention tactic that is capable of meeting AIPM Program objectives under the selected alternative will be recommended. On those occasions where it is not feasible to use only gypsy moth-specific tactics, Bt and diflubenzuron may be used. Specific mitigating measures will help reduce the adverse effects on nontarget organisms. The discussion of effects from the use of Bt and diflubenzuron are presented in Chapter II.
3.	Esprow, Inc. (Columbia, Maryland) is presently involved in a small scale prototype commercial production of NPV. If this small scale effort is productive, they have indicated a desire to expand into a large-scale production. In addition, there are several other companies interested in the commercial production of NPV. The production of Gypchek is a very difficult and time-consuming process as evidenced by the fact that several companies in the past have tried to produce it commercially but failed (e.g., economic constraints, bacterial contamination).

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We would not object to treatment in wilderness
4 areas if only gypsy moth specific tactics are used and treatment is carried out with great care and concern for all aspects of the wilderness.

Sincerely,

Del and Barbara Gillespie

4. See Letter No. 4, response no. 2 for a discussion on intervention tactics in wilderness.

2 0 DEC 1988

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B. C. LEYNES, JR.
Director

DIVISIONS
ADMINISTRATION
HISTORIC LANDMARKS
PARKS AND RECREATION
SOIL AND WATER CONSERVATION

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF CONSERVATION AND HISTORIC RESOURCES
VIRGINIA NATURAL HERITAGE PROGRAM
203 GOVERNOR STREET, SUITE 402
RICHMOND, VIRGINIA 23219
(804) 786-7951

December 15, 1988

David P. Smith
AIPM EIS Team
Suite 718N
1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Smith:

The Virginia Natural Heritage Program (VANHP) has reviewed the Draft EIS for the Appalachian Integrated Pest Management Project - Gypsy Moth Demonstration Project and has the following comments.

1
* Broadcast application of gypsy moth control agents substantially reduces the natural diversity of lepidoptera and leaf-eating beetles (Bt) or invertebrates in general (diflubenzuron) in the treatment area. For this reason, the Heritage Program cannot support a gypsy moth control program that relies on broadcast application of either agent.

2
* Of particular concern to the Heritage Program are cave entrances and karst areas; high-elevation conifer forests; and open-canopy habitats such as shale barrens, limestone barrens, pine-scrub oak woodlands, emergent wetlands, ponds and bogs. For the most part, these are rare habitats in the treatment area, have timber of low commercial value or are poor sites for gypsy moths. No gypsy moth control efforts should be made in these areas and suitable buffers should be maintained.

3
* Wilderness areas and National Parks should be used as control sites where gypsy moth populations are monitored but not controlled. Areas of high human use (e.g. campgrounds, visitor centers) and sites with low biological significance but high scenic value are possible exceptions to this policy.

Response to Comments in Letter No. 59

From: Christopher Clampitt, Virginia Natural Heritage Program

Comment No. Response

1. Bt and diflubenzuron are two of eight intervention tactics considered in action alternatives for the AIPM Program. Decision criteria based upon gypsy moth population levels, resource values and other parameters will determine when applications of Bt or diflubenzuron are appropriate. It is a premature conclusion that the AIPM Program will "rely" on Bt or diflubenzuron as control agents because this is not an eradication program.

See Letter No. 25, response no. 4 and Letter No. 63, response no. 3 for a discussion of effects of diflubenzuron on some nontarget invertebrates.

See Letter No. 24, response no. 3 and Letter No. 23, response nos. 12 and 13 for a discussion of some Lepidoptera affected by applications of Bt.

2. Treatment in these areas is expected to be rare and, if necessary, will be done with the least impacting tactics to these ecosystems, if possible. These rare habitats will receive protection from the adverse effects of treatment and of gypsy moth because of the endangered and threatened species associated with them. (See response nos. 5 and 6 below and Letter No. 53, response no. 42). Adequate protection measures will be determined by the US Fish & Wildlife Service. Sensitive species associated with caves or other karst features will receive appropriate protection as determined by a cooperative effort of land managers, appropriate State agencies and in some cases, the US Fish & Wildlife Service during the site-specific analysis. Factors like the ones mentioned in your letter will be considered in helping to determine whether intervention tactics are appropriate for the site. As stated in Chapter II, pages II-32 - II-37, of the DEIS, Mitigation Measures (which include buffer zones) will be used to minimize the amount of drift from intervention activities onto nontarget locations.

3. National Park wilderness and areas zoned "natural" will serve as comparison areas where treatments to slow the spread or minimize impacts of the gypsy moth will not be conducted (paragraph 4, page II-14 of the DEIS). Language in the DEIS is being changed for the FEIS in alternatives 4, 5 and 6 to reflect that wildernesses will not be treated under AIPM except in certain very specific circumstances.

Developed recreation sites and areas of high value will qualify for some type of intervention tactic providing that the site-specific analysis indicates a need to do so. Even if the "no action" alternative is selected, the existing suppression and eradication program will continue to function and most developed recreational sites and high value areas have qualified for treatment in the past.

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4 * It would be helpful if estimates of the size of treatment blocks and the percentage of the total area to be treated were included in the EIS. Few small blocks will have less long-term effect on biological diversity than will more or larger blocks.

5 * Attached are lists of rare, threatened or endangered species for which the Heritage Program has records in the project area. Some, such as the water shrew, are protected under state endangered species laws, but not the US Endangered Species Act. Many of the species on this list are unlikely to suffer from direct, adverse effects of gypsy moth control, however, indirect effects (e.g. elimination of prey, pollinators or seed dispersal agents) may be significant. Therefore, both direct and indirect effects on these species should be considered in the final EIS.

6 * Given that the DEIS is not site-specific, only general comments are provided here. The Heritage Program should be contacted early in the process of selecting sites for treatment in order to avoid known locations of rare, threatened or endangered species and rare communities.

Thank you for providing this opportunity to comment on the DEIS. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Christopher Clampitt
Ecologist

4. Unfortunately, because we are dealing with a natural phenomenon, we can not predict the extent of treatment that may be necessary at this time. An extensive monitoring system has been installed throughout the AIPM area. This grid system provides male moth trap data and define areas where a more extensive egg mass surveys will be done. This data will be available sometime in February and will be used in the site-specific analysis along with other environmental factors to determine the type of intervention tactic to be used and where intervention will occur in 1989. Monitoring and surveying will continue to determine where intervention is needed in future years.

5. All species classified as endangered, threatened or candidates by the State of Virginia appear in tables III-3 or III-4 and are subject to conservation measures described in the mitigating measures section in Chapter II.

6. Mitigating measures for the AIPM Program include coordination between appropriate agencies (Federal or State) in developing site-specific recommendations for application of intervention tactics. The Virginia Natural Heritage Program is recognized as a branch of State government that will be included in formulating site-specific guidelines for State endangered or threatened species.

A definition has been added to the glossary that describes "appropriate State agencies".

Definition of Abbreviations used on element lists
of the
Virginia Natural Heritage Program
Department of Conservation and Historic Resources

The following ranks are used by the Virginia Natural Heritage Program to set protection priorities. The primary criterion for ranking species is the number of occurrences, i.e. the number of known distinct localities. Also of great importance is the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals. Other considerations may include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences such that ranks will be an index of biological rarity.

S1 Extremely rare; usually 5 or fewer occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare; usually between 5 and 20 occurrences; or with many individuals in fewer occurrences; often susceptible to becoming endangered.

S3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large- scale disturbances.

S4 Common; usually >100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

S5 Very common; demonstrably secure under present conditions.

SA Accidental in the state.

SH Historically known from the state, but not verified for an extended period, usually >15 years; this rank is used primarily when inventory has been attempted recently.

SN Regularly occurring migrants; transients; seasonal, nonbreeding residents. Usually no specific site can be identified with its range in the state. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low collecting effort or cryptic nature of the element.

SX Apparently extirpated from the state.

Global ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means apparently extinct. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species' rarity.

These ranks should not be interpreted as legal designations.

Federal Status

The Virginia Natural Heritage Program uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

LE - Listed Endangered
LT - Listed Threatened
PE - Proposed Endangered
PT - Proposed Threatened
C1 - Candidate, category 1
C2 - Candidate, category 2

3A - Former candidate - presumed extinct
3B - Former candidate - not a valid species under current taxonomic understanding
3C - Former candidate - common or well protected

State Status

The Virginia Natural Heritage Program uses similar abbreviations for State endangerment.

LE Listed Endangered
LT - Listed Threatened
C - Candidate

PE - Proposed Endangered
PT - Proposed Threatened

For information on the laws pertaining to threatened or endangered species, contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species
Department of Agriculture and Consumer Services Plant Protection Bureau for STATE listed plants and insects
Department of Game and Inland Fisheries for all other STATE listed animals

VIRGINIA NATURAL HERITAGE PROGRAM

RARE SPECIES REPORTED FROM THE
AIPM DEMONSTRATION PROJECT AREA

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** CRUSTACEANS					
ANTROLANA LIRA	MADISON CAVE ISOPOD	LT	LT	G1	S1
CAECIDOTEA HOLSINGERI				G3	S1
CAECIDOTEA PRICEI	PRICE'S CAVE ISOPOD			G3	S2
CAECIDOTEA VANDELI				G2	S1S2
MIKTONISCUS RACOVITZAE	RACOVITZA'S TERRESTRIAL CAVE ISOPOD			G2	S1
STYGOBROMUS BAROODYI	ROCKBRIDGE COUNTY CAVE AMPHIPOD			G2	S1S2
STYGOBROMUS CONRADI	BURNSVILLE COVE CAVE AMPHIPOD	C2		G1	S1
STYGOBROMUS ESTESI	CRAIG COUNTY CAVE AMPHIPOD			G1	S1
STYGOBROMUS GRACILIPES	SHENANDOAH VALLEY CAVE AMPHIPOD	3C		G2	S1
STYGOBROMUS HOFFMANI	ALLEGHANY COUNTY CAVE AMPHIPOD			G1	S1
STYGOBROMUS INTERITUS	NEW CASTLE MURDER HOLE AMPHIPOD			G1	S1
STYGOBROMUS MORRISONI	MORRISON'S CAVE AMPHIPOD	C2		G3	S1S2
STYGOBROMUS MUNDUS	BATH COUNTY CAVE AMPHIPOD	C2		G2	S1S2
STYGOBROMUS PSEUDOSPINOSUS	LURAY CAVERNS AMPHIPOD			G1	S1
STYGOBROMUS SPINOSUS	BLUE RIDGE MOUNTAIN AMPHIPOD			G2G3	S1
STYGOBROMUS STEGERORUM	MADISON CAVE AMPHIPOD			G1	S1
** INSECTS					
AUTOCHTON CELLUS	GOLDEN-BANDED SKIPPER			G4	S3
COLIAS INTERIOR	PINK-EDGED SULPHUR			G5	S1S2
ERYNNIS PERSIUS PERSIUS	PERSIUS DUSKYWING			G4T3	SU
EUPHYES BIMACULA	TWO-SPOTTED SKIPPER			G4	S2S4
PYRGUS WYANDOT	SOUTHERN GRIZZLED SKIPPER			G3	S3
SPEYERIA DIANA	DIANA			G3	S3
SPEYERIA IDALIA	REGAL FRITILLARY	C2		G3	SH
** MOLLUSCS					
MENDERSONIA OCCULTA	CHERRYSTONE DROP			G4	S3S4
PLEUROBEMA COLLINA	JAMES RIVER SPINYMUSSEL	LE	LE	G1	S1
** PLANARIA					
SPHALLOPLANA VIRGINIANA	ROCKBRIDGE COUNTY CAVE PLANARIAN			G1	S1
** FISH					
COTTUS COGNATUS	SLIMY SCULPIN			G5	S2
COTTUS GIRARDI	POTOMAC SCULPIN			G4	S3
ETHEOSTOMA LONGIMANUM	LONGFIN DARTER			G3	S3
FUNDULUS DIAPHANUS	BANDED KILLIFISH			G5	S3
LAMPETRA APPENDIX	AMERICAN BROOK LAMPREY			G5	S3
NOTROPIS SEMPERASPER	ROUGHHEAD SHINER			G3	S3
PERCINA REX	ROANOKE LOGPERCH	PE		G2	S1S2
SEMOTILUS MARGARITA	PEARL DACE			G5	S3

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RARE SPECIES REPORTED FROM THE
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SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** AMPHIBIANS					
AMBYSTOMA TIGRINUM	TIGER SALAMANDER		LE	G5	S1
PLETHODON HUBRICHTI	PEAKS OF OTTER SALAMANDER	C2		G2Q	S2
PLETHODON PUNCTATUS	WHITE-SPOTTED SALAMANDER	C2		G3	S2
PLETHODON SHENANDOAH	SHENANDOAH SALAMANDER	C2	LE	G1	S1
** REPTILES					
CLEMMYS GUTTATA	SPOTTED TURTLE			G5	S4
EUMECES ANTHRACINUS	COAL SKINK			G5	S2?
PITUOPHIS MELANOLEUCUS	PINE SNAKE			G5	SU
TANTILLA CORONATA	SOUTHEASTERN CROWNED SNAKE			G5	S2?
VIRGINIA VALERIAE PULCHRA	MOUNTAIN EARTH SNAKE			G5T?	SU
** BIRDS					
CISTOTHORUS PLATENSIS	SEDGE WREN			G5	S1
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW			G5	S3
RIPARIA RIPARIA	BANK SWALLOW			G5	S3
VERMIVORA PINUS	BLUE-WINGED WARBLER			G5	S2
** MAMMALS					
GLAUCOMYS SABRINUS FUSCUS	NORTHERN FLYING SQUIRREL	LE	LE	G5T2	S1
LEPUS AMERICANUS	SNOWSHOE HARE			G5	S1
MICROTUS CHROTORRHINUS	ROCK VOLE			G5	S1
MYOTIS KEENII	KEEN LONG-EARED BAT			G3?	S3
MYOTIS SODALIS	INDIANA OR SOCIAL MYOTIS	LE	LE	G2	S1
NEOTOMA FLORIDANA	EASTERN WOODRAT			G5	S3?
PLECOTUS TOWNSENDII VIRGINIANUS	VIRGINIA BIG-EARED BAT	LE	LE	G5T2	S1
SOREX DISPAR	LONG-TAILED OR ROCK SHREW	C2		G5	S3
SOREX PALUSTRIS	WATER SHREW		LE	G5	SH
SYLVILAGUS TRANSITIONALIS	NEW ENGLAND COTTONTAIL	C2		G4	S4
** FERNS AND FERN ALLIES					
BOTRYCHIUM MULTIFIDUM	LEATHERY GRAPE-FERN			G5	S1
CHEILANTHES CASTANEA	CHESTNUT LIPFERN			G2G	S2
EQUISETUM FLUVIATILE	WATER HORSETAIL			G5	S1
EQUISETUM SYLVATICUM	WOODLAND HORSETAIL			G5	S1
ISOETES MACROSPORA	LAKE QUILLWORT			G5	S1
ISOETES VIRGINICA	A QUILLWORT	C2		G1G2	S1
LYCOPODIUM ANNOTINUM	STIFF CLUBMOSS			G5	S1
LYCOPODIUM INUNDATUM	NORTHERN BOG CLUBMOSS			G5	S1
LYCOPODIUM SELAGO	FIR CLUBMOSS			G5	S1
MATTEUCCIA STRUTHIOPTERIS	OSTRICH FERN			G5	S1
PELLAEA GLABELLA	SMOOTH CLIFF-BRAKE			G5	S1S2

VIRGINIA NATURAL HERITAGE PROGRAM

RARE SPECIES REPORTED FROM THE
AIPM DEMONSTRATION PROJECT AREA

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** GYMNOSPERMS					
ABIES BALSAMEA	BALSAM FIR			G5	S2
JUNIPERUS COMMUNIS	GROUND JUNIPER			G5	S1
** MONOCOTS					
AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS			G5T5	S2
ARETHUSA BULBOSA	SWAMP-PINK			G4	S1
BROMUS CILIATUS	FRINGED BROME			G5	S1
BROMUS KALMII	WILD CHESS			G5	S1
CAMASSIA SCILLOIDES	WILD HYACINTH			G4G5	S2S3
CAREX APPALACHIA	A SEDGE			G?	S1S2
CAREX BARRATTII	BARRATT'S SEDGE	C2		G3	S1
CAREX BUXBAUMII	BROWN BOG SEDGE			G5	S2
CAREX CONOIDEA	FIELD SEDGE			G4	S1
CAREX CRISTATELLA	CRESTED SEDGE			G5	S1
CAREX HIRTIFOLIA	PUBESCENT SEDGE			G5	S1
CAREX HITCHCOCKIANA	HITCHCOCK SEDGE			G5	S2
CAREX LACUSTRIS	LAKE-BANK SEDGE			G5	S1
CAREX POLYMORPHA	VARIABLE SEDGE	C2	C	G2	S1
CAREX PRAIREA	PRAIRIE SEDGE			G5?	S1
CAREX SUBERECTA	PRAIRIE STRAW SEDGE			G?	S1
CAREX TETANICA	RIGID SEDGE			G4G5	S2
CAREX TRISPERMA	THREE-SEED SEDGE			G5	S2
CAREX VESICARIA	INFLATED SEDGE			G5	S1
CLADIUM MARISCOIDES	TWIG RUSH			G5	S2
CORALLORHIZA TRIFIDA	EARLY CORALROOT			G5	S1
CYMOPHYLLUS FRASERI	FRASER'S SEDGE	3C		G4	S2S3
CYPERUS DENTATUS	TOOTHED SEDGE			G4	S1
CYPRIPEDIUM REGINAE	SHOWY LADY'S-SLIPPER			G4	S1
DIARRHENA AMERICANA	AMERICAN BEAKGRAIN			G5	S1
ELEOCHARIS MELANOCARPA	BLACK-FRUITED SPIKERUSH			G4	S1
ELEOCHARIS ROBBINSII	ROBBINS SPIKERUSH			G4G5	S1
ELEOCHARIS SMALLII	CREEPING SPIKERUSH			G5?	S2
ERIOCAULON SEPTANGULARE	WHITE BUTTONS			G5	S1
GOODYERA REPENS	DWARF RATTLESNAKE-PLANTAIN			G5	S2S3
HABENARIA LEUCOPHAEA	PRAIRIE WHITE-FRINGED ORCHID	PT		G2	S1
HELONIAS BULLATA	SWAMPPINK	LT	C	G2	S1
IRIS VERSICOLOR	BLUEFLAG			G5	S1S2
JUNCUS BALTICUS	BALTIC RUSH			G5	S1
JUNCUS BRACHYCEPHALUS	SMALL-HEAD RUSH			G5	SU
JUNCUS NODOSUS	KNOTTED RUSH			G5	S1
JUNCUS TORREYI	A RUSH			G5	S3
JUNCUS TRIFIDUS	A RUSH			G5	S1

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RARE SPECIES REPORTED FROM THE
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SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** MONOCOTS (CONTINUED)					
LACHNANTHES CAROLIANA	CAROLINA REDROOT			G4	S1
LEMNA TRISULCA	STAR DUCKWEED			G5	S1
LILIUM GRAYI	GRAY'S LILY	C2		G2	S2
LIPARIS LOESELII	FEN ORCHID			G5	S2
MALAXIS SPICATA	FLORIDA ADDER'S-MOUTH			G3G4	S2
MILIUM EFFUSUM	TALL MILLET-GRASS			G5	S1
PANICUM HEMITOMON	MAIDENCANE			G5?	S2
POA LANGUIDA	DROOPING BLUEGRASS			G3G4	S1
POA PALUSTRIS	A BLUEGRASS			G5	S3
POA SALTUENSIS	A BLUEGRASS			G5?	S2
POTAMOGETON OAKESIANUS	OAKES PONDWEED			G4	S2
POTAMOGETON TENNESSEENSIS	TENNESSEE PONDWEED			G3	S1S2
SAGITTARIA RIGIDA	SESSILE-FRUITED ARROWHEAD			G5	S1
SCHIZACHNE PURPURASCENS	PURPLE OAT			G5	S1
SCIRPUS ACUTUS	HARD-STEMMED BULLRUSH			G5	S1
SCIRPUS ANCISTROCHAETUS	NORTHEASTERN BULRUSH	C2	C	G1	S1
SCIRPUS LINEATUS	DROOPING BULLRUSH			G4	S1
SCIRPUS SUBTERMINALIS	WATER BULLRUSH			G4G5	S1
SCIRPUS TORREYI	TORREY BULLRUSH			G5?	S1
SMILACINA STELLATA	STARFLOWER FALSE SOLOMAN'S-SEAL			G5	S1
SPARTINA PECTINATA	PRAIRIE CORD GRASS			G5	S1S2
SPIRANTHES OCHROLEUCA	YELLOW NODDING LADIES'-TRESSES			G4	S2
STREPTOPUS AMPLEXIFOLIUS	WHITE MANDARIN			G5	S1
TRILLIUM PUSILLUM VAR MONTICULUM	VIRGINIA LEAST TRILLIUM	C2		G3T1	S1
TRIPHORA TRIANTHOPHORA	NODDING POGONIA			G4	S2
XYRIS CAROLINIANA	CAROLINA YELLOW-EYED GRASS			G4G5	S1
ZIGADENUS GLAUCUS	WHITE CAMAS			G?	S1
** DICOTS					
ACONITUM RECLINATUM	WHITE MONKSHOOD			G2G3	S2S3
ALNUS RUGOSA	SPECKLED ALDER			G5	S1
ANEMONE CANADENSIS	CANADA ANEMONE			G5	S1S2
ANEMONE MINIMA	DWARF ANEMONE	3C		G3	S3
ARABIS HIRSUTA	HAIRY ROCKCRESS			G5	S1
ARABIS SEROTINA	SMOOTH ROCK-CRESS	PE	C	G1	S1
ARALIA HISPIDA	BRISTLY SARSAPARILLA			G5	S2
ARCTOSTAPHYLOS UVA-URSI	BEARBERRY			G5	S1
ASTRAGALUS DISTORTUS	BENT MILK-VETCH			G5	S1
ASTRAGALUS NEGLECTUS				G4G5	S1
BETULA PAPYRIFERA	PAPER BIRCH			G5	S3
BETULA POPULIFOLIA	GRAY BIRCH			G5	S1
BUCKLEYA DISTICHOPHYLLA	PIRATEBUSH	C2	C	G2	S2

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RARE SPECIES REPORTED FROM THE
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SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** DICOTS (CONTINUED)					
CLEMATIS ADDISONII	ADDISON'S LEATHERFLOWER	3C		G2	S2
CLEMATIS ALBICOMA	WHITE-HAIRED LEATHERFLOWER	3C		G4	S3
CLEMATIS COACTILIS	VIRGINIA WHITE-HAIRED LEATHERFLOWER			G3	S3
CLEMATIS VITICAULIS	MILLBORO LEATHERFLOWER	C2		G2	S1
CORNUS CANADENSIS	BUNCHBERRY			G5	S1
CORNUS RUGOSA	ROUNDLEAF DOGWOOD			G5	S2
CRATAEGUS PRUINOSA	A HAWTHORN			G5	S1
DESMODIUM SESSILIFOLIUM	SESSILE-LEAF TICK-TREFOIL			G5	S1
EPILOBIUM LEPTOPHYLLUM	LINEAR-LEAVED WILLOW-HERB			G5	S1
EUPHORBIA PURPUREA	GLADE SPURGE	C2		G2	S1
FILIPENDULA RUBRA	QUEEN-OF-THE-PRAIRIE			G4G5	S1
FRAXINUS NIGRA	BLACK ASH			G5	S2
GALIUM BOREALE	NORTHERN BEDSTRAW			G5	S1
GAYLUSSACIA BRACHYCERA	BOX HUCKLEBERRY	3C		G2	S1
GENTIANA ANDREWSII	FRINGE-TOP BOTTLE GENTIAN			G4	S1
GERANIUM ROBERTIANUM	HERB ROBERT			G5	S1S2
HELENIUM VIRGINICUM	VIRGINIA SNEEZEWEED	C2	C	G2	S2
HELIANTHEMUM PROPINQUUM	LOW FROSTWEED			G4	S1
HIERACIUM TRAILLII	MARYLAND HAWKWEED			G?	S2S3
ILIAMNA REMOTA	KANKAKEE GLOBE-MALLOW	C2		G1	S1
LINUM SULCATUM	GROOVED YELLOWFLAX			G5	S2
LONICERA CANADENSIS	AMERICAN FLY-HONEYSUCKLE			G5	S2
LYSIMACHIA QUADRIFLORA	FOUR-FLOWERED LOOSESTRIFE			G5?	S1
LYSIMACHIA RADICANS	TRAILING LOOSESTRIFE			G4G5	S1
LYTHRUM ALATUM	WINGED-LOOSESTRIFE			G5	S1
MENYANTHES TRIFOLIATA	BUCKBEAN			G5	S1
OENOTHERA ARGILLICOLA	SHALE-BARREN EVENING-PRIMROSE			G3	S3
PACHISTIMA CANBYI	CANBY'S MOUNTAIN-LOVER	C2		G2	S2
PARNASSIA GRANDIFOLIA	LARGE-FLOWERED GRASS-OF-PARNASSUS			G2G3	S1
PARONYCHIA VIRGINICA VAR VIRGINICA	YELLOW NAILWORT	C2		G4T1Q	S1
PHLOX BUCKLEYI	SWORDLEAF PHLOX	3C		G2G3	S2S3
POLANISIA DODECANDRA	A CLAMMYWEED			G5Q	S1
POTENTILLA TRIDENTATA	THREE-TOOTHED CINQUEFOIL			G5	S3
PRUNUS ALLEGHANIENSIS	ALLEGHANY PLUM	3C		G3	S2
RHAMNUS LANCEOLATA	LANCE-LEAVED BUCKTHORN			G4G5	S2
SANGUISORBA CANADENSIS	CANADA BURNET			G5	S1
SCUTELLARIA PARVULA VAR PARVULA	SMALL SKULLCAP			G4G5	S1
SIDA HERMAPHRODITA	VIRGINIA MALLOW	3C		G3	S1
SOLIDAGO HARRISII	SHALE BARREN GOLDENROD	3C		G3Q	S2
SOLIDAGO PATULA	A GOLDENROD			G5	S3
SOLIDAGO RANDII	RAND'S GOLDENROD			G?	S?
SPIRAEA LATIFOLIA	NORTHERN MEADOW-SWEET			G5	S2S3

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SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	GLOBAL RANK	STATE RANK
** DICOTS (CONTINUED)					
THALICTRUM MACROSTYLUM				G4?	S3
THALICTRUM STEELEANUM	STEELE'S MEADOW-RUE	C2		G2Q	SU
TRICHOSTEMA SETACEUM	NARROW-LEAVED BLUE CURLS			G5	S2
TRIFOLIUM VIRGINICUM	KATE'S-MOUNTAIN CLOVER	C2		G3	S3
VACCINIUM MACROCARPON	LARGE CRANBERRY			G4	S3
VERONICA SCUTELLATA	MARSH-SPEEDWELL			G5	S1
VIOLA WALTERI	PROSTRATE BLUE VIOLET			G4G5	S1
ZANTHOXYLUM AMERICANUM	NORTHERN PRICKLEY ASH			G5	S2

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20 DEC 1988

December 16, 1988

Luella L. Smith
637 Constitution Drive
Virginia Beach, Virginia
23462

David P. Smith
AIPM EIS Team
Suite 718 N
1720 Peachtree Rd., N.W.
Atlanta, Georgia 30367

Subject: Comments on AIPM EIS

Dear Mr. Smith:

1 Although I have had the materials since first received in October I have been unable to adequately study and research more on the subject due to other commitments, travel, and the holiday rush. I make all my Christmas gifts and have been working on those since early October and not finished yet.

I am very appreciative to have received the materials. But I must admit I was kind of surprised as it is the first time I have ever seen or received such a document and I must admit I was sort of overwhelmed at first. You can be sure I am reading it and still interested in the subject. I am very sorry that I was unable to respond in the time frame because of my situations.

Thank you for keeping me informed and once again I'm sorry to have left you down on my response.

Sincerely,

Luella Smith

Mrs. Luella L. Smith

Response to Comments in Letter No. 60

From: Luella Smith

Comment No.	Response
1.	Comment noted.

20 DEC 1988

61

WEST VIRGINIA FORESTRY ASSOCIATION

P.O. BOX 724
RIPLEY, W. VA. 25271
PHONE (304) 273-8164

December 16, 1988

Mr. David P. Smith
AIPM DEIS Team
Suite 718N 1720 Peachtree Rd. N. W.
Atlanta, Georgia 30367

Dear Mr. Smith:

The West Virginia Forestry Association appreciates the opportunity to make comments on the DEIS For the AIPM Gypsy Moth Demonstration Project.

1 We recommend: (1) that alternative 6 (page II-16) be used; (2) Control must be cost effective as well as environmentally acceptable.

2 The Association does not accept that Gypsy Moth can be used as a tool of silviculture.

3 We recognize Gypsy Moth as man induced and not a natural catastrophy.

4 In our opinion, Gypsy Moth defoliations are not acceptable in any management plan and will cause both long term and short term negative effects on timber production, wildlife habitat and recreation.

5 The acceptance of alternative 6 will help keep down lawsuits that will come from adjacent landowners.

Thank you.

Richard P. Grist
Richard P. Grist
Chairman, Public Affairs Comm.

RPG:dm

cc: WVFA

"Serving the Forestry Community"

Response to Comments in Letter No. 61

From: Richard Grist, Chairman, Public Affairs Committee
WV Forestry Association

Comment No.	Response
1.	Comment noted.
2.	Comment noted.
3.	Comment noted.
4.	Comment noted.
5.	Comment noted.

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20 DEC 1988

12-17-88

Dear Mr. Smith,

Reading through the DEIS for the AIPM Gypsy Moth Demonstration Project
1 was a very interesting and educational experience for me. It appears to have taken a great of time + preparation and I intend to keep it as a source of information in the future.

I, personally, am not an advocate of any type of insecticide on a large scale basis and most types even on a small scale. I feel that in the past, chemical treatments used to combat pests effectively, have later proved harmful to our soil, water, air, beneficial insects, vegetation, wildlife, domestic animals, and humans as well. I am sure that none were used with that intention, but it seems to take a while before we really know. I am not a chemist and reading

Response to Comments in Letter No. 62

From: Bill Sullender

Comment No.	Response
1.	Comment noted.

through this statement I am sure you also are aware of future consequences. Hopefully, we can live with the Gypsy as we have the Chestnut Blight hoping that one day neither will be a plague to us.

My comments will probably get to you a little late and thats my fault. Good Luck with your project and please continue to keep me informed as you have so well in the past.

Sincerely,

BILL SULLENDER
421 STUART AVE.
STUARTS DRAFT, VA.
24477

63

0 3 JAN 1989

December 19, 1988

Mr. David P. Smith
EIS Team Leader
USDA Forest Service, Southern Region
1720 Peachtree Road, NW
Atlanta, GA 30367

RE: Draft EIS for the AIPM Gypsy Moth Program

Dear Mr. Smith:

1 The gypsy moth poses a difficult problem for conservationists. If we do nothing - major components of the forest and its diversity will be harmed by this pest. If we try to "control" its damage - a similar fate could also occur. I commend the Forest Service for its attempt to balance the facts and inputs on this difficult issue. However, I offer several points that need more thorough consideration in the decision-making process and should be part of the final EIS.

2 1. The draft EIS does not evaluate the impact of large versus small spray block size for diflubenzuron. Although the draft EIS recognized the effect on nesting songbirds of small Bt spray blocks (may require them to forage outside of block), no assessment was provided when spray blocks exceed 1000 acres - thus making it highly inefficient for songbirds to feed their young due to energy expended over lengthened travel distance. Since diflubenzuron is much longer lasting and more deadly to arthropods than Bt, it is very important that the impact of large spray blocks of this broad-spectrum pesticide be addressed in the final EIS. I am familiar with the bird research of Cooper et al. in West Virginia and know that the effects of large spray blocks were not studied.

3 2. The impact to aquatic organisms from spraying diflubenzuron on "canopy-covered" wetlands and streams is not adequately addressed in this report. No rationale is offered for why there would be no impact to the ecology of these wetlands and streams from spraying diflubenzuron. From my experience in Western Maryland, the timing of spray efforts to control gypsy moth occurs before the canopy is completely leafed out. The small droplet size of aerial spraying will ensure that some amount of this chemical will reach aquatic organisms. Combined with a small rain event, the wash off and concentration of diflubenzuron in headwater streams and wetlands (by far the majority of wetlands in the study area) may impact the ecology of

Response to Comments in Letter No. 63

From: D. Daniel Boone, Committee for a Quality Environment

Comment No.	Response
1.	Comment noted.
2.	There are no known direct effects of diflubenzuron on birds regardless of spray block size. Indirect effects of applications of diflubenzuron would include adjustments of foraging habits for some canopy-feeding birds that key on leaf-eating insects. i.e., caterpillars. (See discussion on Effects of Diflubenzuron on Insects in Chapter IV). Not all leaf-eating insects are susceptible to applications of diflubenzuron, however there are no known species of birds that feed exclusively on diflubenzuron susceptible leaf-eating insects. With the degree of foliage protection achieved from treatment by diflubenzuron, it is reasonable to assume that insects which feed on plant juices or feed on the underside of leaf surfaces will be present and an available food supply for insectivorous birds. Martinat, Cooper and others (1986) observed no significant population shift of four foraging guilds investigated (low forager, canopy forager, bark forager and flycatching forager) in 50-acre spray blocks. No significant difference in abundance was observed for 22 species examined. However, all bird species combined occurred less frequently on treated vs untreated plots which does suggest a slight population shift probably due to competition between species for food. The fact that abundance of species found in treated and untreated plots were similar, indicates bird populations are weakly influenced by fluctuations in prey availability resulting from applications of diflubenzuron. A study is in progress to determine the effects of diflubenzuron on the productivity of songbirds (West Virginia Division of Forestry, West Virginia University). See Letter No. 23, response nos. 12 and 13 for a discussion on effects of Bt on some nontarget Lepidoptera.
3.	"Canopy covered" wetlands and streams would receive the same dose from aerial applications of diflubenzuron as "canopy covered" land. The amount of diflubenzuron that reaches the ground (includes water surface of streams and wetlands) has been observed to be less than 20% of the applied dose (Jones, Kochendefer, 1987) and observed to be less than 10% by Smith and Edmunds (1985). Hansen and Garten (1982) observed no response of 5 species of mayflies, 7 species of stoneflies, 4 fly species, 3 caddis fly species and 4 species of beetles to .1 ppm concentrations of diflubenzuron in a laboratory stream community. See Letter No. 25, response no. 4, part b. for more discussion of some effects of diflubenzuron on aquatic ecosystems at different concentration levels. Diflubenzuron dissipates rapidly in streams in field situations (Huber and Collins, 1987; Jones and Kochendefer 1987) and in impounded bodies

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these important resources by altering the food chain and effecting nutrient cycling. Not enough research has been done to discount the impact of diflubenzuron on watershed drainages -- especially those in large spray blocks. The impact of spraying diflubenzuron on canopy-covered wetlands and streams deserves a full discussion in the final EIS. Indeed, page IV-36 should add: 12. Determine the effects of diflubenzuron on aquatic organisms, stream and wetland ecology, and soil ecology (especially from breakdown product accumulation).

3. The draft EIS inadequately compares the impacts to endangered species from diflubenzuron control activities. Potential adverse effects to bats is mentioned (p. IV-34) for both treatments, making it sound as though there would be no difference in the extent of these impacts from the use of either Bt or diflubenzuron. Since diflubenzuron is much longer lasting
4 and more deadly to a much wider range of arthropods than Bt, it is difficult to accept that the impact to food resources for these endangered bats (and thus to the bats) would not be greater from using diflubenzuron. Again, this impact may be much greater if large spray blocks are utilized.

I also question whether the impact of "no treatment" would cause adverse effects to the Madison Cave isopod, swamp pink, shale baren rockcress, or harperella (note correct spelling!). I am familiar with the above plants and their habitats, and believe that the susceptibility of their habitat to the gypsy moth is very low. It is unclear to me how the cave isopod could be susceptible to defoliation or forest mortality if it has survived
5 the repeated disruption of soil nutrient cycling involved in clearcutting operations in the catchment area for the cave's water supply. However, it is not difficult for me to be extremely concerned with the threat to this endangered crustacean from diflubenzuron, and I commend the position of the U.S. Fish
6 and Wildlife Service and this draft EIS to spare the catchment of this isopod from this new contamination. I urge that this same policy be extended to all category 1 and 2 candidate cave invertebrates and susceptible terrestrial arthropods.

4. The draft EIS should give a more complete comparison of
7 the efficacy of using Bt. Only the Delaware experience is cited, but there are other efforts that have shown much better success than this study. Particularly, the NPS at the Catoctin Mountain Park has utilized Bt with very favorable results (fide Noel Schneeberger). While the cost effectiveness of a double application of Bt is undoubtedly less than diflubenzuron, the "control" effectiveness may be comparable. A more complete discussion of this subject would improve the final EIS.

of water (Apperson et al, 1978, NYE, 1977) in most cases. See Letter No. 4, response no. 1 for a more thorough discussion of the fate of diflubenzuron. There are no doubt impacts to the ecology of a wetland or stream from the introduction of diflubenzuron, however, the dose from AIPM projects has not demonstrated any lasting or significant disruption of food chains or nutrient cycling in research accumulated to date. As more and newer information on effects of diflubenzuron becomes available, mitigation measures and/or standards and guidelines for the AIPM Program will be modified as necessary.

The identified research needs section in Chapter IV has incorporated your recommendation for seeking additional information.

4. The formula for supporting conservation of endangered and threatened species through the AIPM program begins with the selection of alternatives considered in detail (Chapter II) modified by mitigating measures (Chapter II) and ends with establishment of standards and guidelines for individual species at the project level. See Letter No. 53, response no. 40 for discussion of how endangered species resources will be handled under AIPM.

5. The spelling of harperella has been corrected. Appendix B contains a biological evaluation of potential adverse effects to Federally-listed endangered or threatened species. The objective is to conserve populations of endangered and threatened species. A site-specific analysis of potential effects of all alternatives (including a no treatment option) is necessary to fulfill our responsibilities under the Endangered Species Act.

6. Comment noted.

7. See Letter No. 38, response no. 2 concerning the comparison of diflubenzuron, Bt and NPV. Also, see response 1 of the same letter for a comparison of intervention costs for Bt and diflubenzuron. We could not find Noel Schneeberger. If you know where to locate him, please contact the FPM Field Representative in Morgantown, Wv.

Mr. David Smith
12/19/88
Page 3

8 5. In a departure from many fellow conservationists, I urge that Wilderness Areas be sprayed with Bt when their significant old-growth or near old-growth forest stands are in jeopardy. To do nothing to protect these extremely limited resources is irresponsible. I am not advocating prophylactic measures, but whenever monitoring indicates extensive mortality can or will occur - spray it! Obviously the susceptibility to gypsy moth defoliation of wilderness forest stands needs to first be evaluated, and then these susceptible tracts should be analyzed to assess their potential for repeated defoliation and mortality. Other vulnerable habitats on Wilderness Areas should likewise receive this consideration. I encourage the Forest Service to fund the state's Natural Heritage Programs to collect and develop information about significant species and habitats within the expanding range of the gypsy moth.

9 In conclusion, I recommend that spray block size be regulated to minimize effects on wildlife and wetland resources. I urge caution in the use of diflubenzuron, especially since much is still unknown about its effects on forest and wetland ecology. And I hope that Bt will be utilized more extensively in VA and WV than it was in MD; perhaps restricting diflubenzuron to extremely high densities of gypsy moth (hot spots) and supplementing this surgical approach with Bt applied to surrounding areas in one or two treatments. Finally, our Wilderness Ares should not receive "hands-off" management if we are to adequately protect their biological diversity. I suggest that valued tracts in these protected areas, such as old-growth forest, be afforded the full protection that biological gypsy moth control offers, and that the Forest Service assist with the identification and evaluation of these important habitats.

Sincerely,

D. Daniel Boone

D. Daniel Boone
Committee for a Quality Environment
8111 Chestnut Avenue
Bowie, Maryland 20715

DDB/ctm

8. The responsible official in the Record of Decision will select an alternative that will be implemented under the AIPM Program that could involve wilderness treatment. Further site-specific analysis and NEPA documentation is needed before an intervention tactic occurs in wilderness. General criteria or special procedures for infestations in wilderness are listed in the Alternatives Considered in Detail section in Chapter II of the FEIS.

As stated under Mitigating Measures, pages II-32 - II-37 of the DEIS, coordination between appropriate agencies (Federal and State) for developing site specific recommendations for the application of intervention tactics will occur. The States' Natural Heritage Programs are recognized as an agency that will be consulted in formulating site-specific guidelines for State endangered or threatened species. Funding for these agencies is not relevant for the purposes of the AIPM Program.

9. Comment noted.

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21 DEC 1988

Division of Forestry
West Virginia University
College of Agriculture and Forestry

December 15, 1988

David P. Smith
A.I.P.M. EIS Team Leader

Dear Dr. Smith:

I have gone over the AIPM Draft Environmental Impact Statement and expect I have little to contribute, but this is my view.

1 Concerning the AIPM alternatives, I would go along with Alternative 5 as the one to use. Considering the General Project Area and Wilderness, Alternative 5 apparently has the potential to be effective yet moderate with respect to Wilderness. Here leaving out diflubenzuron seems reasonable.

I see this as a large and expensive project. I'm sure much valuable data (over)

304 293-3825 □ 206 Percival Hall □ P O Box 6125 □ Morgantown, WV 26506-6125

Response to Comments in Letter No. 64

From: Earl H. Trygon, WV University, Division of Forestry

Comment No.	Response
1.	Comment noted.

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will be accumulated, but if I understand correctly, costs will not be considered as part of the project. Yet will not control costs and forest value
2 be used to determine whether or not to use control measures in the final analysis?

Sincerely,
Earl H. Tryon
Earl H. Tryon
Professor Emeritus of Silviculture

2. The "costs" referred to are the costs associated with implementing a particular management action. The relative values at risk will, of course, be used to determine whether action of any type is warranted. The costs of carrying out management actions will be tracked and used in the final financial analysis of the Project as a means of providing the background information necessary to develop benefit cost analyses.

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22 DEC 1988

12-18-88

Dear Mr. Smith,

I am writing to cast my vote in favor of a minimum intervention
1 program. For I believe we are stuck with the Gypsey moth and heavy use of pesticides and chemicals create a great risk with no long run benefit.

We introduced the menace so perhaps we should also introduce a few natural predators. Anything
2 beyond this again creates other risks without resolving the problem

Thank you,

Charles Kostelni

Response to Comments in Letter No. 65

From: Charles Kostelni

Comment No.	Response
1.	Comment noted.
2.	See Letter No. 28, response no. 2.

66

22 DEC 1983

94 ORchard Street
Keyser, W. Va
26726

David P. Smith
A I P M EIS Team
Suite 718 N
1720 Peachtree Road, N.W.
Atlanta, GA.
30367

Thank you for sending me a copy of the Draft - Environmental Impact Statement for the A I P M - Gypsy Moth Demo. Program.

I prefer program alternative - #3 -
1 The AIPM program would be implemented ~~&~~ carried out - but NO Action other than monitoring would occur in wilderness.

I am a wilderness user, my background is a Forestry Degree - W.V.U. - Parks & Recreation Resource - I realize the problem of gypsy moth - and non-sprayed areas can potential spread to surrounding areas. I believe
2 we must follow the basic philosophy of wilderness management - "hands off" with the exception of man made problems must be managed - ie - trails, campsite, pollution
I feel plan 3 - will allow us to monitor

Response to Comments in Letter No. 66

From: Frank O'Hara

Comment No.	Response
1.	Comment noted.
2.	The policy towards wilderness in AIPM area will basically be "hands off" management as you suggest. Even if alternative 4, 5 (preferred) or 6 is selected, gypsy moth populations will be allowed in wilderness unless one of 4 conditions occur (see Alternatives Considered in Detail in Chapter II of the FEIS), at which time we will consider taking action. The site-specific analysis will determine whether action is necessary in wilderness.

and The wilderness will serve as a
3 control. I am concerned That
spraying could cause possible pollution of
contamination of water sources. All efforts
must be made to preserve The
4 wilderness; however The wilderness Forest will decide its own fate.
I feel The Forest Service county
government, all State governments and regional
authorities should address The
gypsy moth as a total cooperation.
The consensus is That gypsy moth is
a problem — economically to The Forest
but — many private land owners must be
5 protected. We can no longer afford
to treat one area — and allow other
areas to go untreated. The Forest remains
leave The wilderness as is — If it is
to be managed as wilderness. The other
Forest fits with The U.S. Forest Service
multiple use program management plans.

Please keep me informed.

I hope my remarks will be accepted —
~~in~~ time.
My copy was delivered to The wrong address -
This causing a delay. Thank you

Frank O'Hara

3. As explained in the summary in Chapter II as well as on page IV-24 of the DEIS, the addition of diflubenzuron is not expected to affect water quality. The persistence of diflubenzuron in water sources in the general environment have indicated a half-life of less than 24 hours (Willcox and Coffey, 1978). With the mitigation measures listed on pages II-32 - II-37 in the DEIS, minimal amounts of diflubenzuron should reach water sources.

4. See response no. 2.

5. AIPM is to be [redacted] coordinated county, State and Federal gypsy moth program over [redacted] large geographical areas with [redacted] major objective of minimizing the spread and adverse effects of gypsy moth. As indicated on page I-2 of the DEIS, all lands within the Project are eligible for intervention tactics without cost to the landowner. Participation in the Project is voluntary.

See response no. 2 for wilderness discussion.

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TROUT UNLIMITED

23 DEC 1988

Clarksburg. W. Va. 26301
Dec. 29 1988.
Kenneth L. Aspy
117 Thompson St
Clarksburg W Va. 26301

David P. Smith
Suite 718N
1720 Peachtree Rd. N.W.
Atlanta. Ga. 30367

Dear Friend:

I hope this is not arriving to late. We meant to have it discussed much sooner.

At our last meeting, discussion was had and it was of the opinion of the group that
1 Alternative #6 page II16 was most appropriate. As we are most interested in trout fishing + clean water the mention of a buffer zone was a pleasing factor. Our concerns were with mentioned Fish + Aquatic Ecosystem found on page
2 III5. Clean water both stream + ground are our concern.
3 The comparison of Diflubenzoron on page II7 was a deciding factor also as the staying effect of 20 days seemed more adequate. If we can help in any way - we are available.

Sincerely
Kenneth L. Aspy

Founded in 1959... Over twenty-five years of trout and salmon conservation
Washington, D.C. Headquarters • 501 Church Street, N.E. • Vienna, Virginia 22180 • 703-281-1100

Response to Comments in Letter No. 67

From: Kenneth L. Aspy, Trout Unlimited

Comment No.	Response
1.	Comment noted.
2.	See Letter No. 4, response no. 1, Letter No. 36, response no. 3 and Letter No. 50, response no. 2 for discussions of diflubenzuron effects on trout. See Letter No. 48, response no. 4 for a discussion of effects of gypsy moth on water quality and Letter No. 63, response no. 3 for a discussion on effects of diflubenzuron on other aquatic organisms.
3.	Comment noted.

GLOSSARY

CHAPTER VII

GLOSSARY

Acceptable daily intake (ADI).--The maximum dose of a substance that is anticipated to be without lifetime risk to humans when taken daily.

Active ingredient (a.i.).--The effective part of a pesticide formulation, or the actual amount of the technical material present in the formulation.

Acute toxicity.--The toxicity of a compound when given in a single dose or in multiple doses over a period of 24 hours or less.

Administrative unit.--All the National Forest System lands for which one forest supervisor has responsibility.

Affected environment.--The environment of the area(s) to be affected or created by the alternatives under consideration in the EIS.

Air quality.--The composition of air with respect to the quantities of pollutants. Most frequently used in connection with standards of maximum acceptable pollutant concentrations.

Alternative.--A proposition or situation offering a choice between two or more management methods, only one of which may be chosen.

Amellaria mellea.--A naturally occurring fungus, the shoestring fungus, normally acting as a secondary pathogen, that becomes a primary pathological agent in trees weakened by drought or other stresses such as defoliation. This pathogen is the agent responsible for a great deal of tree mortality in areas that have been defoliated by gypsy moth.

Amphibians.--A class of animals including frogs and salamanders that begin life in water, breathing through gills, but later develop lungs. As adults, they breathe air but are found in or near water.

Anticline.--A sharply arched fold of stratified rock. The strata slope downward in opposite directions from the center, or highest point (see also: syncline).

APHIS.--Animal and Plant Health Inspection Service. The USDA agency responsible for regulating mateirals which have potential for artificially moving gypsy moth out of quarantined areas and for eradicating isolated infestations of gypsy moth.

Apparent naturalness.--The perception and value placed upon impacts and activities on the wilderness resource as percieved by wilderness visitors. Closely related to natural integrity.

Appropriate State agencies.--Land management or resource management branches of State government affected by the AIPM program; includes State natural heritage programs.

Arthropods.--Major group of invertebrate animals belonging to the phylum Arthropoda. This group includes insects, spiders and crustaceans.

Augmentation.--Encouragement or artificial introduction of an established species of parasite or predator that dramatically increases the number of these animals present in an area.

__Bacillus thuringiensis__.--Scientific name of a bacterium that is pathogenic to the larval stage of many lepidopterous insects. The active ingredient in biological insecticides are under such names as Dipel[R], Bactospeine[R] and Thuricide[R].

Biological evaluation.--1) The gathering, analysis, and interpretation of technical data from an entomological standpoint to provide a sound base for making pest management decisions, 2) the term for an analysis process used to determine if a proposed action "may affect" an endangered or threatened species or, to determine effects of a proposed action on sensitive species.

Biosynthesis.--The use of living organisms to produce chemical compounds.

Canopy.--The cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

Category 1 Species.--Species identified by the USDI Fish and Wildlife Service for which known information supports the appropriateness to propose to list them as Endangered or Threatened.

Carcinogenicity.--Tendency of a substance to cause cancer.

Chitin.--A semi-transparent horny substance forming the principal component of crustacean shells, insect exoskeletons and the cell walls of certain fungi.

Class I area.--One of three classes of areas provided for in the Clean Air Act for the Prevention of Significant Deterioration program. Class I areas are the "cleanest" area and receive special visibility protection. They are allowed very limited increases (increments) in sulfur dioxide and particulate matter concentrations in the ambient air over baseline concentrations. (See 42 U.S.C. 7473 for description of the specific increments).

Clearcutting.--The harvesting, in one cut, of all trees in an area for the purpose of creating a new, even-aged stand. The area harvested may be a patch, stand, or strip large enough to be mapped or recorded as a separate age class.

Code of Federal Regulations (CFR).--The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. The Code is divided into 50 titles which represent broad areas subject to Federal regulations. Each title is divided into chapters which usually bear the name of the issuing agency. Each chapter is further subdivided into parts covering specific regulatory areas.

The Code of Federal Regulations is kept up to date by the individual issues of the Federal Register. These two publications must be used together to determine the latest version of any given rule.

Colluvial.--An area where loose rock fragments, sand, etc, accumulate, such as at the bottom of slopes.

Commercial forest land.--Forest land which is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as commercial timberland have

the capability of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands. Currently, inaccessible and inoperable areas are included.)

Commercial thinning.--Cutting by means of sales for products (poles, posts, pulpwood, etc.) in immature stands to improve the quality and growth of the remaining stand.

Concern.--See "management concern."

Conservation of Endangered Species.--Efforts undertaken to bring a population of an endangered plant or animal to the point where continued existence of a species is no longer in question.

Cultural resources.--The physical remains (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context of an area (such as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples) which is useful or important for making land-use planning decisions.

Decline phase.--The phase of the gypsy moth cycle following outbreak when populations are falling off to innocuous levels (see also: innoucuous mode, outbreak mode, release phase).

Delimiting traps.--Adult male gypsy moth traps set out in close grid formation to determine the geographic extent of a particular population. This approach is usually used by APHIS to determine the extent of an isolated infestation.

Developed recreation.--Use of a fairly small, distinctly defined area where facilities are provided for concentrated public use -- campgrounds, picnic areas, swimming areas, etc.

Diflubenzuron.--The active ingredient of insecticide formulations sold under the trade name Dimilin. Acts as a growth regulator by interfering with chitin synthesis and prevents gypsy moth larvae and some other immature chitin synthesizing insects and crustaceans from successfully completing their molting process.

Disparlure.--Commercially synthesized female gypsy moth sex pheromone. Disparlure is used to disrupt mating by making it difficult for male moths to locate female moths.

Dispersed recreation.--That portion of forest and rangeland used for recreation outside of developed sites. Examples include scenic driving, hunting and backpacking.

Diversity.--The variety, distribution and abundance of different plants and animals.

Dosage rate.--Quantity of a toxicant applied per unit area. Usually expressed as oz. or lbs. active ingredient per acre.

Draft environmental impact statement (DEIS).--A detailed, written statement of effects required for major Federal actions under Section 102(2)(c) of the National Environmental Policy Act and released to the public and other agencies for review and comment.

Early forest succession.--Those plant communities that occupy an area immediately following the removal or destruction of the vegetation in an area.

Ecosystem.--The system formed by the interaction of a group of organisms and their environment.

Edge.--The more or less well-defined boundary between two or more elements of the environment. For example, field/woodland.

Effects.--Include: 1) direct effects, which are caused by the action and occur at the same time and place, 2) indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. 3) cumulative effects, which are the result of activities occurring in many places at the same time or, activites occurring repeatedly in the same place over time. Effects and impacts are synonymous.

Egg masses.--Gypsy moth eggs, deposited in groups of 100 to 1,000 in tan, hairy clumps on the underside of tree branches, in bark fissures, under rocks and in other protected areas.

EIS.--Acronym for environmental impact statement.

Endangered species.--Any species that is in danger of extinction throughout all or a significant part of its range. Endangered species are designated in the Federal Register by the Secretary of Interior.

Endemic.--Of or confined to a particular locality. When contrasted to "epidemic", refers to relatively low and stable populations.

Endocuticle.--Innermost layer of the external skeleton of insects, made up of chitin and protein.

Environmental analysis.--An investigation of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; and direct, indirect, and cumulative effects. This process provides the information needed for identifying actions that may be categorically excluded, for preparing environmental documents, and for determining whether an environmental impact statement is required.

Environmental assessment (EA).--A concise public document that: briefly provides sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a finding of no significant impact; aids an agency's compliance with the act when no Environmental Impact Statement is necessary; and, facilitates preparation of a statement when one is necessary.

Epidemic.--An outbreak, i.e., an abnormally large, rapidly spreading pest population.

Even-aged management.--The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Final environmental impact statement (FEIS).--An agency's official position on its responsibilities under the National Environmental Policy Act. The statement is prepared after comments have been received and considered on a draft edition. (See "Draft environmental impact statement.")

Floodplain.--The lowland and relatively flat areas adjoining inland and coastal waters (including debris cones and floodprone areas of offshore islands) including, at a minimum, those areas subject to a 1-percent or greater chance of flooding in any given year (100-year recurrence).

Forb.--Any herbaceous plant other than grass or grasslike plants.

Forest Plan.--See National Forest Land and Resource Management Plan.

Formulation.--The form in which a pesticide is packaged or prepared for use.

FPM.--Forest Pest Management Staff Unit, USDA Forest Service.

Fuels.--A term used to describe material such as dead brush and trees that provide material for fires.

Game species.--Animals (including fish) which are protected by State or Federal regulations and pursued by hunters and anglers i.e., squirrel, rabbit, deer, bear, turkey, trout, bass, etc.

General forest area.--Land of which at least 10 percent consists of forest trees of any size. Also includes land that formerly had such tree cover, and not currently developed for nonforest use.

GIS.--Acronym for Geographic Information System. This is a computerized system used to store, analyze and plot data in map format. It is used to describe where and when conditions have existed in the past in order to aid in making decisions on future actions.

Habitat.--The place where a plant or animal lives. Habitat consists of food, water, cover and space.

Half-life.--The time required for half the amount of substance (such as an insecticide) in or introduced into a living system to be eliminated whether by excretion, metabolic decomposition, or other natural process.

High-hazard tree.--One which, because of a lack of structural integrity, poses a danger to people or property.

ICO.--Acronym for Issues, Concerns, and Opportunities.

Infestation.--The presence of large numbers of insects in an area.

Inherited sterility.--A developing technique used for managing gyspy moth populations. Laboratory-reared male gypsy moth pupae are exposed to radiation and mated with normal females. The resulting eggs are partially sterile. These eggs are collected in the laboratory and released into natural gypsy moth populations in the field. The partially sterile eggs produce sterile larvae which feed and develop normally, mate with the normal females but result in completely sterile eggs and no progeny.

In-holdings.--Lands within the boundaries of a national forest, and which are owned by another agency, organization or person.

Innocuous mode.--The first phase of a gypsy moth outbreak, characterized by very low populations of the gypsy moth. This phase may last for many years (see also: release phase, outbreak mode, decline phase).

Instar.--The term for a insect before each of the molts (shedding of its skin) it must go through in order to increase in size. Upon hatching from its egg, the insect is in instar I and is so called until it molts, when it begins instar II, etc.

Integrated pest management (IPM).--IPM is a process for selecting strategies to regulate forest pests to achieve resource management objectives. It is the planned and systematic use of detection, evaluation, and monitoring techniques; and all appropriate silvicultural, biological, chemical, genetic, and mechanical tactics needed to prevent or reduce pest-caused damage and losses to levels that are economically, environmentally, and aesthetically acceptable.

Interdisciplinary team (ID team).--Consists of persons with different professional backgrounds useful in preparing an environmental impact statement. The members of the ID Team that prepared this EIS are listed in chapter V.

Intermediate cut.--Any removal of trees from a stand between the time of their formation and the harvest.

Intervention tactics.--The range of management activities that are used against a pest. Available intervention tactics against the gypsy moth include parasites and predators, male confusant techniques, mass trapping, sterile egg release, sterile male moths, the use of the gyspy moth-specific nucleopolyhedrosis virus (available as Gypchek®), and the use of biological and chemical insecticides.

Invertebrate.--The group of animals characterized by the lack of a backbone which includes arthropods and clams.

Irretrievable.--Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible.--Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Issue.--A subject or question of widespread public interest relating to the AIPM project.

Larva.--An immature, worm-like stage of an insect, between the egg and pupa.

LD_{50}.--Median lethal dose, is the milligram of toxicant per kilogram of body weight (mg/kg) lethal to 50 percent of the test animals to which it is administered under the conditions of the experiment.

Lepidoptera.--A large order of insects, including the butterflies and moths; characterized by four scale-covered wings and coiled sucking mouthparts.

Major issues.--The result of consolidating issues, concerns and opportunities identified in scoping. Major issues form the basis for developing and evaluating alternatives and, analyzing effects.

Management area.--An area that has a common management direction. For example, an area of general forest adjacent to a wilderness boundary may be managed to reduce the risk from gypsy moth.

Management concern.--An issue, problem, or an identifiable condition that constrains the range of available management practices.

Management direction.--A statement of multiple-use and other goals and objectives, the associated management prescriptions, and the standards and guidelines for attaining them.

Management practice.--A specific act, measure, or course of action, or treatment.

Management prescription.--Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.

mg/kg.--Milligrams per kilogram; used to designate the amount of chemical received per kilogram of body weight of test organisms. One mg/kg = 1 ppm. One mg = 0.000035 ounce, and 1 kg = 2.2 pounds.

mg/kg/day.--Milligrams per kilogram of body weight per day.

Mitigation.--Actions to avoid, minimize, reduce, eliminate or rectify the impacts of a management practice.

Molting.--The process or casting off the old exoskeleton and creating a new one as an insect grows or changes in body form.

Multiple use.--The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all of the resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of the uses that will give the greatest dollar return or the greatest unit output.

Mutagenicity.--The capacity of a substance to cause changes in genetic material.

National Environmental Policy Act (NEPA).--Establishes a national policy to encourage productive and enjoyable harmony between man and the environment, to promote efforts that will prevent or eliminate damage to the environment and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality.

National forest land and resource management plan.--A plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as

amended. This plan guides all natural resource management activities, and establishes management activities, standards, and guidelines for each national forest.

National Forest Management Act (NFMA).--A law passed in 1976 amending the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest Plans and the preparation of regulations to guide that development.

National Forest System land.--National Forests, National Grasslands, and other related lands for which the Forest Service is assigned administrative responsibility.

National Wilderness Preservation System.--All lands covered by the wilderness act and subsequent wilderness designations, irrespective of the department or agency having jurisdiction.

Natural integrity.--The degree as to which long-term ecological processes are intact and operating. The extent to which human influences have altered natural processes away from conditions one might expect had these impacts not occurred.

Natural regeneration.--The renewal of a tree crop by natural means, or without efforts to seed or plant trees. The new trees grow from selfsown seeds or by vegetative means such as root suckers.

NEPA process.--All measures necessary for compliance with the requirements of Section 2 and Title I of NEPA.

NOEL.--The No Observable Effect Level. In a series of dose levels tested, it is the highest level at which no effect is observed.

Nontarget organisms.--Any living entity that is not the target of the application of a management tactic.

Nucleopolyhedrosis virus (NPV).--A category of viruses. In the context of the gypsy moth, a virus that is specific to it. It has been formulated and registered as an insecticide, Gypchek®.

Objective.--A concise, time-specific statement of measurable, planned results that respond to chosen goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used to achieve the goals.

Old growth.--Forest plant communities that exhibit a greater diversity of structure and stand condition than other sucessional stages of the same forest type. Usually characterized by older trees that show signs of decline.

Outbreak.--See epidemic.

Outbreak mode.--The phase of a gypsy moth outbreak characterized by extremely high populations of the pest, causing widespread and serious damage (see also: decline phase, innocuous mode, release phase).

Parasite.--Any animal that lives in, on, or at the expense of another.

Particulates.--Small particles suspended in the air and generally considered pollutants.

Pheromone.--An odor given off by insects which influences the behavior of other members of the same species (and in some cases, other species also).

Pheromone trap. --Traps developed to catch male gypsy moths. There are several types, but they all are baited with an artificially manufactured female gypsy moth sex attractant called a pheromone.

Physiographic region (or subregion).--An area or division of land in which the pattern of topographic elements (altitude, relief and land forms) are characteristic throughout and as such, distinguish it from other areas with different sets of topographic elements.

Phytotoxic.--Poisonous or harmful to plants.

Ppm.--Parts per million; the number of parts of substance in question per million parts of a given material. (1 ounce of salt in 62,500 lbs of sugar). One ppm = 1 mg/kg (on a weight basis) = 1 mg/liter (water or air).

Predation.--Animals feeding upon other animals, such as the gypsy moth being fed upon by skunks.

Preferred alternative.--The alternative recommended to be adopted. The preferred alternative was identified from the range of alternatives that were evaluated in the NEPA process.

Primitive recreation.--A type of recreation available in an unmodified natural environment. The site is of a size or remoteness to offer isolation from the sights and sounds of humans, and a feeling of vastness of scale. Visitors have an opportunity to be part of the natural environment and encounter a high degree of challenge and risk.

Programmatic.--In the context of this document, a term meaning that the document itself represents a broad or general approach for dealing with the gypsy moth.

Proposed action.--In terms of the National Environmental Policy Act, the project, activity or decision that a Federal agency is recommending to implement or undertake.

Proposed species.--Any species of fish, wildlife, or plant that is proposed by the Fish and Wildlife Service or the National Marine Fisheries Service to be listed as threatened or endangered.

Pupa.--An immature, resting stage of some insects between the larva and adult.

Pupate.--A process in an insect's life cycle in which the larva develops into a pupa.

Recovery plan.--A USDI Fish and Wildlife Service approved plan which addresses recovery objectives for a plant or animal species listed as threatened or endangered.

Recreation visitor day (RVD).--Twelve visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more persons.

Regeneration.--The renewal of a tree crop whether by natural or artificial means. Also, the young crop itself.

Release phase.--The phase of a gypsy moth outbreak following the innocuous phase during which gypsy moth populations begin to build rapidly from very low levels to

populations capable of causing widespread and serious damage (see also: innocuous mode, outbreak mode, decline phase).

Research natural areas.--An area in as near a natural condition as possible that exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes.

Resource use and development opportunities.--A possible action, measure, or treatment introduced during the scoping process which subsequently may be incorporated into and addressed by the EIS in terms of a management prescription.

Riparian areas.--Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of the aquatic and riparian ecosystems, floodplains, and wetlands.

Riparian ecosystem.--A riparian ecosystem is a transition between the aquatic ecosystem and the adjacent terrestrial ecosystem and is identified by soil characteristics and distinctive vegetation communities that require free or unbound water.

Scenic value.--A desired level of visual quality based on physical and sociological characteristics of an area.

Scope.--The range of actions, alternatives, and impacts to be considered in an environmental impact statement.

Scoping.--The procedure by which the Forest Service determines the extent of analysis necessary for an informed decision on a proposed action. Scoping is an integral part of environmental analysis.

Sensitive species.--Those plant and animal species within the Project Area identified by:

a. Regional Foresters as having significant current or predicted downward trends in population numbers or density or, significant current or predicted downward trends in habitat capability that would reduce species distributions on National Forest System lands;

b. The Virginia Department of Agriculture and Consumer Services as State endangered, threatened, proposed or candidate species;

c. The West Virginia Department of Natural Resources as State critically imperiled, imperiled, or imperiled globally or;

d. The USDI Fish and Wildlife Service as candidate species under review for listing.

e. The National Park Service as a species of concern due to federal status.

Shade-intolerant plants.--Plant species that do not germinate or grow well in shade.

Shade-tolerant plants.--Plants that grow well in shade.

Silvicultural system.--A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified

according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced.

Silvicultural treatments.--Actions taken in a forest based on the theory and practice of controlling the establishment, composition, constitution, and growth of forests.

Site preparation.--The removal of competition and conditioning of the soil to enhance the survival and growth of seedlings or to enhance the germination of seed.

Slash.--Woody debris left after logging, pruning, thinning or brush cutting. It includes logs, chunks, bark, branches, stumps, and broken small trees or brush.

Snags.--Individual standing dead trees, interspersed within healthy, growing forest stands.

Soil compaction.--Any process by which the soil grains are rearranged to decrease void space and bring them into closer contact with one another, thereby increasing the weight of solid material per cubic foot.

Soil productivity.--The capacity of a soil to produce a specific crop, such as fiber, forage, under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.

Solitude.--Isolated from the sights, sounds, and presence of others and the developments and evidence of humans.

Stand.--Trees that grow in the same location, and which are fairly uniform in type, age and risk classes, vigor, size class, and stocking class. The similarity of these qualities distinguish the stand from adjacent stands that contain trees with different features.

Standard.--A principle requiring a specific level of attainment; a rule to measure against.

Succession.--The progressive development of trees or other plants toward their highest role in their ecology; their climax. The replacement of one forest, or other plants, by others.

Suppression.--Suppression activities must use the strategy which applies the best combination of available tactics considering effectiveness with respect to resource management goals, economics, environmental concerns and human safety. Suppression takes two forms--direct and indirect.

Direct suppression is action taken against a pest to reduce its population. Examples are prescribed fire, removal of pests by cutting and removing infested materials, use of pesticides, and release of parasites or predators.

Indirect suppression is the altering of conditions favorable to a pest population and leads to a decline. It involves the same activities as prevention. The difference between prevention and indirect suppression is that in indirect suppression, damaging pest populations already exist and the intent is to reduce their damage to an acceptable or tolerable level.

Suppression projects.--A systematic, planned and budgeted effort to control a pest.

Supplemental wilderness attributes.--Ecological, geopogical or other features of scientific, educational, scenic, or historical value although not necessary in wilderness, do enhance wilderness quality if they exist to any extraordinary degree.

Syncline.--A downfold of stratified rocks, from whose central axis the beds rise upward and outward in opposite directions (see: anticline).

Threatened species.--Any plant or animal that is likely to become an endangered species within the foreseeable future in all, or a significant portion, of its range. Threatened species are designated in the Federal Register by the Secretary of the Interior.

Tiering.--Refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basin-wide program statements or ultimately site-specific statements) incorporated by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

Timber stand improvement (TSI).--Activities conducted in young stands of timber to improve growth rate and form of the remaining trees.

Two-lined chestnut borer.--Agrilus bilineatus. A long-horned beetle that attacks oaks that have been weakened by drought or defoliation. They cause considerable mortality in trees that have been defoliated by gypsy moth.

Type.--A classification of forest land based on the tree species that predominates in the area.

Type conversion.--The conversion of the dominant vegetation in an area from one species to another.

Understory.--Plants growing below the canopy of other plants. Usually refers to grasses, forbs, and low shrubs under a tree or brush canopy.

Uneven-aged management.--The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter and provide for the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

USDA.--U.S. Department of Agriculture.

USDI.--U.S. Department of the Interior.

Watershed.--The entire area that contributes water to a drainage system or stream.

Wetlands.--Those areas that are inundated by surface or ground water often enough to support plants and other aquatic life that requires saturated or seasonally saturated soils for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

Wilderness.--Areas designated by congressional action under the 1964 Wilderness Act including subsequent supplements and amendments. Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

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APPENDIX A

WILDERNESS

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WILDERNESS

Congress passed the Wilderness Act "to secure for the American people of present and future generations, the benefits of an enduring resource of wilderness". Federally-owned areas were to be "administered for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness ...". The Act describes wilderness as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Wilderness is further defined in the Act as "an area of undeveloped Federal land retaining its primeval character and influence ...."

The Act further defines wilderness as an area that:

1. generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;

2. has outstanding opportunities for solitude or a primitive and unconfined type of recreation;

3. has at least 5,000 acres of land or is of sufficient size as to make practical its preservation and use in an unimpaired condition, and

4. may also contain ecological, geological, or other features of scientific, educational, scenic or historical value.

The Wilderness Act directs the Forest Service and National Park Service to protect the natural character of wilderness and to provide for recreational, scenic, scientific, educational, cultural, and historical uses of wilderness.

Wilderness Management Goals

Wilderness is a unique and vital natural resource. Based on the management direction derived from the Wilderness Act (P.L. 88-577) wilderness is managed to minimize the impact of man and his technology. Management seeks to minimize the impact of use rather than use itself. In this respect, humans are temporary visitors who leave no permanent imprint. The forces of nature dominate the landscape; human activity is limited to that of an unobtrusive observer. Manipulation of the flora, fauna, or the surface of the land is not allowed.

Wilderness exemplifies freedom, but is characterized more by the absence of human impact than by an absence of human controls. Management is tailored to preserve spontaneity of use and as much freedom from regimentation as possible, while preserving the naturalness of the wilderness resource. To the extent that the wilderness resource is not impaired, wilderness is managed to provide opportunities for primitive recreation featuring solitude, physical and mental challenge, freedom from the intrusion of unnatural sights and sounds, the chance to experience unmodified natural ecosystems, and to travel and live without mechanized aids in an environment where successes and failures are directly dependent on one's abilities and knowledge.

In order to accomplish these goals, national forest wilderness resources are managed to promote, perpetuate and, where necessary, restore the wilderness character of the land. Management will enhance specific wilderness values of

solitude, physical and mental challenge, scientific study, inspiration and primitive recreation. To accomplish this, the Forest Service Manual, 2320.2, Amend. 97, 1986, directs the Forest Service to:

1. Maintain and perpetuate the enduring resource of wilderness as one of the multiple uses of National Forest System land.

2. Maintain wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces.

3. Minimize the impact of those kinds of uses and activities generally prohibited by the Wilderness Act, but specifically excepted by the Act or subsequent legislation.

4. Protect and perpetuate wilderness character and public values including, but not limited to, opportunities for scientific study, education, solitude, physical and mental challenge and stimulation, inspiration, and primitive recreation experiences.

5. Gather information and carry out research in a manner compatible with preserving the wilderness environment to increase understanding of wilderness ecology, wilderness uses, management opportunities, and visitor behavior.

Descriptions of the 15 Specific Wildernesses

Wilderness locations are found in the Alleghany Plateau, Appalachian Ridge and Valley, and Blue Ridge geographic provinces. The areas all have tree species that make excellent gypsy moth hosts. Following is a brief description of the general characteristics and attributes of the areas.

Ramseys Draft Wilderness

General Description

This 6,725 acre wilderness is on the Deerfield Ranger District of the George Washington National Forest in Augusta and Highland Counties, Virginia. It is approximately 18 miles northwest of Staunton, Virginia. Elevations range from 2,200 to 4,282 feet on top of Hardscrabble Knob. The terrain is mountainous with narrow ridgetops and steep slopes. The forest consists of chestnut, scarlet, red, white and black oaks as well as various other hardwood species on the slopes to hemlock, white pine and cove hardwoods in the drainage bottoms. Virgin stands of hemlock are located in the upper drainages of the wilderness.

Natural Integrity

The area is affected by natural forces as a self enclosed drainage with the only outside influence being acid rain. This is currently being studied and has yet to cause noticeable change in the ecosystem of the drainage.

Apparent Naturalness

The area within the wilderness has been considered a special area even before wilderness designation. Commercial logging has never occurred with the only timber cut being the salvage of dead and dying trees in proximity to an old road

down the center of the drainage. This road has been destroyed by recent flooding. Evidence of the road remains but does not impair the wilderness quality.

Outstanding Opportunities for Solitude

The steep slopes of the rugged terrain, dense vegetation and few access points allow opportunities for solitude. Areas along existing trails offer less solitude while cross country travel offers the best opportunity. Sounds from U.S. Highway 250 penetrates the wilderness for a short distance at its most southern access points.

Opportunities for Primitive Recreation

The opportunities for primitive recreation are abundant in this wilderness. There are few hazards that encourage challenging experiences. Current recreational use consists of hiking, backpacking, camping, hunting and nature study. Visitors primarily engage in day use activities, mainly hunting and hiking. Highest recorded use occurred in October and November during the hunting season. Recreational use is considered light for the entire wilderness with use concentrated on the old road location and existing trail.

Supplemental Wilderness Attributes

The virgin hemlock stands located in the upper drainages of the area are unique and significant features in the wilderness as well as on the national forest. These stands are typical of those found in more northern latitudes. The Ramseys Draft Research Natural Area consisting of 1,794 acres is also included within the wilderness.

Scenic Values

The area is typical of the Appalachian Ridge and Valley land type. The steep topography, old growth vegetation and natural appearing landscapes are the greatest scenic value of this wilderness.

St. Marys Wilderness

General Description

St. Marys Wilderness with 10,090 acres is located on the Pedlar Ranger District of the George Washington National Forest in Augusta County, Virginia. Located 10 miles south of Staunton, Virginia, St. Marys is adjacent to the Blue Ridge Parkway and comprises the upper watershed of the St. Marys River.

The river is recognized for its superb trout fishery and has been designated a Scenic River by the State of Virginia. Characterized by mixed hardwoods broken by occasional fallen rock slopes, the area ranges in elevation from 1,700 feet at the river to 3,640 feet on Cellar Mountain. Terrain is steep and rugged with many quartzite cliffs and talus slopes.

Natural Integrity

The area is a self enclosed drainage of the St. Marys headwaters which include Hogback Creek, Chimney Branch and Mine Bank Creek. Boundaries of the wilderness are steep and rugged affording excellent natural integrity. Of concern is the

effect of acid rain on St. Marys River as it seems to be particularly susceptible to it.

Apparent Naturalness

Strip mining at the turn of the century for manganese and iron ore has impacted the wilderness. Remnants of the excavations, railroad bed, haul roads and ore processing structures are quite evident around the area of the old mines. The remainder of the wilderness is predominately second growth hardwood forest which has acquired a natural appearance.

Outstanding Opportunities for Solitude

Along the lower portions of the St. Marys River going through the gorge is a particularly popular area readily accessible for its water related recreation. The area is considered over used in some respects and does not offer the opportunity for solitude appropriate to wilderness.

Away from the river a series of five separate free-standing mountain peaks within the wilderness make for a great diversity of terrain and give the impression of spaciousness and solitude.

Opportunities for Primitive Recreation

St. Marys River and its gorge are particularly known for its beauty and native trout fishery. Within the steep slopes of the watershed, the terrain itself is relatively gentle. Opportunities for family-oriented primitive recreation activities exist but not of a challenging nature.

Supplemental Wilderness Attributes

St. Marys river and its gorge are the major attractions of this wilderness.

Scenic Values

The land has a great diversity of terrain and vegetation which when viewed from overlooks of the Blue Ridge Parkway offer an unbroken forest canopy of spectacular scenery. St. Marys River and its gorge are of particular importance as a scenic resource.

Rich Hole Wilderness

General Description

Rich Hole Wilderness is approximately 12 miles northwest of Lexington, Virginia, in Alleghany and Rockbridge Counties of the George Washington National Forest. Originally comprised of 5,600 acres of the upper watersheds of North Branch, Alum Creeks and Brushy Mountain, subsequent land acquisition has increased the size to 6,450 acres since the RARE II Study.

Brushy Mountain is double crested in its central portion with the crests being separated by "holes" up to 500 feet deep which drain along cascades through gorges down to the main creeks. Giant hemlocks are found in abundance along the cascades and creeks while chestnut and scarlet oaks as well as various other hardwoods are found through the remainder of this wilderness.

Natural Integrity

Being the upper drainage of several waterways, Rich Hole Wilderness is minimally affected by outside forces.

Apparent Naturalness

Logging which occurred in the area approximately 100 years ago left numerous cove locations that went uncut due to their inaccessibility. These pockets of large hardwoods were focal points for Forest Service management for many years.

In 1978, the "Easter Ice Storm" severely damaged many of the large specimens through crown breakage and uprooting.

Site specific remnants from turn of the century iron mines, equipment foundations and railroad beds on the east side of the area can be found. However, these have essentially been reclaimed by natural forces.

Outstanding Opportunities for Solitude

The numerous coves and drainages provide ample opportunity for extended periods of solitude while cross country hiking. However, the trail along the east side of the wilderness is heavily impacted by the Interstate Highway particularly near Brattons Run and Simpsons Creek Drainage.

Opportunities for Primitive Recreation

Primary uses of the wilderness are hunting and hiking, with a popular hiking trail providing access through the area. Challenging experiences are limited to cross country hiking which is afforded by the numerous rock outcrops in the upper elevations.

Supplemental Wilderness Attributes

The term "Rich Hole" is derived from the unique areas of giant old growth trees in the rich pockets of the area. These pockets of giant trees are the key features of this wilderness.

Scenic Values

Variety of vegetation and topography with water cascades and huge old trees contribute to the scenic quality of this wilderness.

Rough Mountain Wilderness

General Description

On the Warm Springs Ranger District of the George Washington National Forest, Rough Mountain Wilderness is located approximately 16 miles northwest of Lexington, Virginia, in Bath and Alleghany Counties. The wilderness comprises approximately 9,300 acres of mountain between Pads Creek on the east and the Cowpasture River on the west. The wilderness is characterized by rugged terrain and conspicuous rock escarpments. Upland oaks, pitch and Table Mountain Pine are the predominate forest types.

Natural Integrity

The area is a mountain ridge of consolidated Forest Service ownership and is minimally affected by outside forces.

Apparent Naturalness

This wilderness has very few permanent improvements. Two trails are located within the wilderness, one traverses the mountain in a northwest-southeast sidehill direction with the other trail on the ridge itself.

Outstanding Opportunities for Solitude

Bordering railroad tracks and high speed roadway are adequately buffered by dense vegetation allowing opportunities for solitude. Trails for cross country hiking provide ample opportunity for extended periods of solitude.

Primitive Recreation

Hunting and hiking are the primary uses of this wilderness. Numerous jump-off points from bordering roads, trails, and railroad tracks facilitate access to the area. Challenging experiences from rugged terrain and rock escarpments will be limited to cross country hikers and hunters.

Supplemental Wilderness Attributes

The rugged, isolated mountain forms are the major attractions of this wilderness.

Scenic Values

Steep, rugged terrain with little variety of vegetation. Panoramic vistas of surrounding forest land may be seen at a distance.

Cranberry Wilderness

General Description

Cranberry Wilderness with 35,864 acres is the largest single National Forest Wilderness in the state of West Virginia. It is located on the Gauley Ranger District of the Monongahela National Forest in Webster and Pocahontas Counties, West Virginia. Located approximately 70 miles northeast of Charleston, the wilderness is characterized by broad, massive mountains with narrow steep drainages of the Cranberry and Williams Rivers. Northern and mixed hardwoods are the predominant forest cover types of this wilderness.

Natural Integrity

The wilderness is minimally affected by outside forces with ten percent of the area being affected.

Apparent Naturalness

Evidence of old timber cuts, railroad grades, trail shelters and a old bridge are visible but do not impair the wilderness quality. The general impression of the wilderness is one of rugged, relatively undisturbed woodlands.

Outstanding Opportunities for Solitude

The steep drainages and vegetation screen out noise from roads or other external forces. Solitude is available to those activities that use the natural environment. Cross country hiking provides ample opportunity for extended periods of solitude.

Opportunities for Primitive Recreation

The opportunity for primitive recreation is low. There are only a few hazards that encourage challenging experiences. Current recreation use consists of hiking, backpacking, cross-country skiing, trout fishing and other dispersed recreation activities. In 1986 recreation use was estimated at 34,000 visitor days.

Supplemental Wilderness Attributes

There are no unique supplemental wilderness attributes.

Scenic Values

The steep topography and natural appearing landscape are the greatest scenic values of this wilderness.

Otter Creek Wilderness

General Description

This 20,000 acre wilderness is on the Cheat Ranger District of the Monongahela National Forest. The area is located in Randolph and Tucker Counties, West Virginia about five miles from Elkins. Broad, massive mountains dissected by Otter Creek and its tributaries characterize this wilderness. Northern and mixed hardwoods, red and norway spruce and upland brush are the major vegetative cover types.

Natural Integrity

Natural processes are operating in the wilderness with approximately 10 percent of the area impacted by artificial forces.

Apparent Naturalness

Evidence of human activities are found in old railroad grades, timber cuts, and a trail shelter. They have little impact and the apparent naturalness of the wilderness is high.

Outstanding Opportunities for Solitude

The terrain and plant screening offer opportunities for solitude. Evidence of the old railroad grade, timber cuts and trail shelter are slowly being reclaimed by natural processes.

Opportunities for Primitive Recreation

With 13,200 visitor days of recreational use recorded in 1986, the opportunities for primitive types of recreation are low. Hiking, hunting, camping, backpacking, and other dispersed forms of recreation are the primary uses of this wilderness.

Supplemental Wilderness Attributes

A small stand of virgin spruce and hemlock is found on the eastern boundary of the wilderness.

Scenic Values

The wilderness is typical Alleghaney Plateau and does not vary significantly in scenic value when compared to the rest of the National Forest.

Dolly Sods Wilderness

General Description

The Dolly Sods Wilderness is comprised of 10,215 acres of National Forest land. The area contains a portion of the headwaters of the Red Creek drainage in Tucker and Randolph Counties, West Virginia. It is approximately twelve miles west of Petersburg, West Virginia. Broad, massive mountains with steep slopes covered with red pine, red spruce, northern and mixed hardwoods as well as upland brush are characteristic of this wilderness.

Natural Integrity

The influence of past fires, timber harvests and the establishment of pine plantations have had a moderate influence on the natural processes. Duration of these impacts will last for a number of years.

Apparent Naturalness

Past human activities are readily apparent in the form of old timber cuts, pine plantations, railroad grades and the effects of fire. These impacts will be readily evident for a number of years to come. Overall, these impacts have only a minimal effect to the entire wilderness and the apparent naturalness is moderate.

Outstanding Opportunities for Solitude

Wilderness solitude can be obtained to some degree by vegetative screening and terrain characteristics of the area.

Opportunities for Primitive Recreation

Opportunities for a primitive type recreation experience can be obtained to some degree but overall opportunity is low. There were 17,000 visitor use days recorded in 1986 in day use activities such as hunting and hiking. There are few hazards that encourage challenging experiences.

Supplemental Wilderness Attributes

There are no unique supplemental wilderness attributes.

Scenic Values

At the higher elevations, Dolly Sods Wilderness offers outstanding scenic values, in particular, the high country bogs with their unique vegetation. The lower elevations have scenic values comparable to the rest of the National Forest.

Laurel Fork North and South Wilderness

General Description

Laurel Fork Wilderness is located in Randolph County, West Virginia on the Greenbrier Ranger District of the Monongahela National Forest. It is approximately fifteen miles southeast of Elkins, West Virginia. The area is characterized by rolling mountains steeply dissected by Laurel Fork. The Laurel Fork River divides the area into two wilderness sections, Laurel Fork North (6,055 acres) and Laurel Fork South (5,997 acres). Northern hardwoods is the primary vegetative composition type of the area.

Natural Integrity

Natural processes are at work in the area. Only ten percent of the area is being impacted by artificial forces.

Apparent Naturalness

Evidence of human activities are found in old railroad grades, timber cuts and wildlife openings. These are essentially being reclaimed by natural forces.

Outstanding Opportunities for Solitude

Topographic and plant screening provide a moderate potential for solitude. Distances from core to perimeter is short in each wilderness.

Opportunities for Primitive Recreation

Current recreation use consists of hunting, hiking, camping, backpacking, and other dispersed recreation activities. Visitors engage primarily in day use activities. The area lacks diverse challenging opportunities.

Supplemental Wilderness Attributes

The major unique feature of these wildernesses is Laurel Fork.

Scenic Values

No outstanding scenic values are noted when compared to the rest of the National Forest.

James River Face Wilderness

General Description

This wilderness is on the Glenwood Ranger District, Jefferson National Forest in Bedford and Rockbridge Counties, Virginia. At 8,903 acres this wilderness is approximately 8 miles from Bunea Vista and 15 miles from both Lexington and Lynchburg, Virginia. Elevations range from 600 feet at the James River to 3,037

feet at Highcock Knob. The physiographic landform is characterized by steep, sloping ridges, rocky soils and numerous cliffs and bluffs. The forest overstory is a mixed eastern hardwood forest, chestnut oak, scarlet oak and Virginia Pine at the higher, dry sites and white pine, hemlock, poplar, hickory and various other mixed hardwoods on the moist, lower slopes and drains. Approximately 40 percent of the wilderness is in pine and the remainder in hardwood, predominately oak.

The James River forms the northeast boundary of the wilderness and the Blue Ridge Parkway is part of the southern boundary.

The Appalachian Trail, a national scenic trail traverses through the wilderness .

Natural Integrity

There are two large abandoned sandstone quarries within the wilderness. Elk Creek Quarry is adjacent to Forest Service Road 35 for approximately half a mile and is twenty acres in size. Quarrying stopped in the 1950's. Big Hellgate Quarry is located on Big Hellgate Creek, just inside the wilderness boundary. It was under special use permit until 1965 but has not been used since then. Both quarries have significantly impacted their immediate surroundings. Other impacts such as trails, shelters and roads have had a minor effect on the natural integrity.

Apparent Naturalness

The two old quarries have large areas of exposed soil and little vegetation. However, little soil movement has occurred off site but it is also apparent that little revegetation is occurring in the area.

Two Appalachian Trail shelters were in existence before wilderness designation. One shelter has been removed, Matts Creek Shelter, is still being used. Forest Service Road 602 was revegetated in the 1970's and is now the Sulphur Springs Trail and generally appears natural.

Outside of the trails and quarries, most of the interior appears natural to the visitor as there was no past timber sales or home sites.

Outstanding Opportunities for Solitude

Most of the interior of the wilderness is remote and rugged, providing opportunities for solitude. However, there are many areas from which visitors can look down upon the developed valley below or hear traffic from Virginia Highway 130. Opportunities for solitude is also remote on the Appalachian Trail as this is a popular hiking trail.

Opportunities for Primitive Recreation

Present use of the wilderness is 3,811 recreation visitor days primarily in the form of hiking, backpacking, hunting, horseback riding and rock climbing. Six trails in addition to the Appalachian Trail provide access to the wilderness for recreational opportunities. A large rock slide, commonly called Devils Marble Yard, just off the Belfast Trail is a frequent destination for day hikers.

Supplemental Wilderness Attributes

The rise in elevation from 650 feet near Snowden to 3,073 feet on Highcock Knob results in altitudinal differences in canopy species and associated wildlife. Within the wilderness, several rare species of flora can be expected: Panax quinquefolium, Ginseng is present as well as Tsuga carolinana, Carolina Hemlock which occurs as an isolated specimen. Also encountered is Castanea dentata, American Chestnut, which occurs as sprouts or saplings.

James River Face Wilderness is also the only National Forest Wilderness in the State of Virginia which has been designated as a Class I air value area.

Scenic Values

Panoramic views of the developed valley can be obtained from many areas within the wilderness. The unique views of the James River because of the topographical rise in the area enhance scenic quality.

Thunder Ridge Wilderness

General Description

At 2,450 acres, this is one of the smallest, continuous wildernesses in the AIPM Project Area. Located in portions of Rockbridge and Botetourt Counties, Virginia, the wilderness is on the Glenwood Ranger District of the Jefferson National Forest. Glasgow, a small rural community is approximately 4 miles away while Bunea Vista (11 miles), Lexington (14 miles) and Lynchburg (15 miles) are nearby towns.

Landforms are characterized by steeply sloping ridges and rocky soils. Elevations vary from 1,300 feet near East Fork Elk Creek to 4,200 feet at Apple Orchard Mountain. Vegetation can be characterized as a mixed eastern hardwood forest containing many tree species including oaks, poplar, hickory, black cherry and hemlock. A stunted northern red oak forest dominates the summit of Apple Orchard Mountain. Approximately 85 percent of the wilderness can be classified as upland oak.

The Blue Ridge Parkway forms the southeastern boundary of the wilderness.

Natural Integrity

With the exception of the Appalachian Trail, there is little evidence of human activity.

Apparent Naturalness

The overall human influence on naturalness is considered low. The Appalachian Trail traverses through the wilderness and its use is well established.

Outstanding Opportunities for Solitude

The wilderness offers limited opportunities for solitude based on its small acreage, narrow topography and southeast boundary with the Blue Ridge Parkway.

Opportunities for Primitive Recreation

Primitive opportunities for the wilderness are minimal with backpacking and hiking the primary two uses. Challenging opportunities are limited due to the wilderness small size and lack of topographic features. Present use is approximately 1200 recreation visitor days.

Supplemental Wilderness Attributes

The Peaks of Otter (also known as Thunder Ridge) Salamander, Plethodon nettingi hubrichti, an threatened animal species is found within the area. Gray's lily, Lilium grayi, a threatened plant species was found on the slopes of Thunder Ridge several years ago. Its presence in the same area today has not been documented.

Ginseng, Panax quinquefolium, also occurs here and is designated as a threatened species by the State of Virginia. Near Thunder Ridge Overlook is the northeastern distribution of Carolina Hemlock, Tsuga caroliniana except for a stray specimen near the James River.

Scenic Values

The spring flora is the greatest scenic attraction in this wilderness. Large areas dominated by the shrub Rhododendron catawbiense produces spectacular blooms while colonies of the Large Flowered Trillium, Trillium grandiflorum enrich the surroundings with color.

Shawvers Run Wilderness

General Description

This 3,665 acre wilderness is on the New Castle Ranger District, Jefferson National Forest, in Craig County Virginia. Three population centers, ranging in population from 8,000 at Covington to 300,000 in the Roanoke complex, are within a two hour drive of this wilderness. At 14 miles, Covington is the nearest population center while Roanoke and Clifton Forge are approximately 20 miles away.

The area contains rugged and remote mountainous tracts, covered with hardwood forests interspersed with yellow pine on the south and west exposures. Hemlock and white pine occur in the major stream bottoms. Approximately 80 percent of the wilderness is in upland oaks and the remaining 20 percent in pine types. Elevations range from 2,000 feet along Shawvers Run to 3,800 feet atop of Hanging Rock. Valley Branch and Shawvers Run, two drainages in the wilderness, have been classified as wild trout streams.

Natural Integrity

Timber regeneration and road construction have changed the vegetative composition to a minor degree. Human effect on natural processes are low, generally less than 5 percent of the area.

Apparent Naturalness

The wilderness contains 73 acres of clearcuts which occurred in 1973 and .2 mile of road which was closed in 1975. These past disturbances are being reclaimed by natural processes.

Outstanding Opportunities for Solitude

The topographic features of the Shawvers Run Drainage and the headwaters of Valley Branch will screen out much of the surrounding intrusions. Current access to the wilderness is by cross country travel from perimeter roads.

Opportunities for Primitive Recreation

Primary uses of this wilderness are rock climbing, fishing, hunting and backpacking. Use is considered low at 400 recreation visitor days a year.

Supplemental Wilderness Attributes

The wilderness has a special geologic interest in the 240 acre Hanging Rock Area which is located in the southern corner of the wilderness.

Scenic Values

The wilderness is typical Appalachian "Ridge and Valley".

Barbours Creek Wilderness

General Description

This wilderness is on the New Castle Ranger District of the Jefferson National Forest. It covers about 5,700 acres in Craig County, Virginia and is located approximately 20 miles from Roanoke, Virginia. The Barbours Creek Area is typical of the Appalachian Mountains in that it contains steep, rugged mountainous terrain covered with hardwood forests. Yellow pine dot the southern and western exposures while white pine and hemlock are present along major stream bottoms. Approximately 85 percent of the wilderness is in upland oak and the remainder in pine. Elevations range from 1,700 feet along Barbours Creek to 3,800 feet along Potts Mountain.

The main stream in Barbours Creek is Lipes Branch which is classified as a wild trout stream. Streams in the area drain into the North Fork of Barbours Creek or Barbours Creek, both of which are wild trout fisheries.

Natural Integrity

Human activity has noticeably impacted the natural processes in the wilderness through 260 acres of clearcut (from the time period of 1969-1975), 10 wildlife clearings and 3.4 miles of road.

Apparent Naturalness

The appearance of human activity in the area is quite evident. Although the road and wildlife openings have been abandoned, it will take a period of time as the natural processes reclaim these areas and give them, along with the clearcuts, a naturalized appearance.

Outstanding Opportunities for Solitude

Minimal opportunities for solitude exist in this area. The north boundary along the east crest of Potts Mountain offers the best opportunity. Although this

boundary is in fact a jeep road, motorized use is infrequent except during the hunting season.

Opportunities for Primitive Recreation

Opportunities exist for fishing, hiking, backpacking, camping, and hunting. Lipes Branch Trail bisects the wilderness and is currently the only designated trail. Present use is 1,100 recreation visitor days a year. The area along Barbours Creek and Virginia Highway 617 (adjacent to wilderness) receives heavy use from campers, hunters and fishermen.

Supplemental Wilderness Attributes

The designated wild trout streams are the unique features in this wilderness.

Scenic Values

Scenic values are typical to that of the surrounding national forest land.

Mountain Lake Wilderness

General Description

Mountain Lake Wilderness is located on the Blacksburg Ranger District of the Jefferson National Forest in Craig and Giles Counties, Virginia and Monroe County, West Virginia. The entire wilderness is 10,753 acres in size but only 4,025 acres are within the project area (that portion located in Craig County, Virginia and Monroe County, West Virginia). The nearest population center is Blacksburg, Virginia which is approximately ten air miles away. The wilderness exhibits typical physiographic features of the Appalachian Ridge and Valley Province in that it is mountainous terrain consisting of steep slopes with high sandstone escarpments. Elevation ranges from 2,200 feet to 4,100 feet. Overstory vegetation in the project area is uniform in age and consists mainly of hardwoods. Dominant tree species include scarlet oak, chestnut oak, northern red oak, white oak, hickory, yellow poplar and red maple. Scattered stands of pitch and table mountain pine are also found throughout the wilderness. The area within the project boundary is located on the slope of Potts Mountain and Little Mountain. Soils are generally stable with a low to average site index for upland oak. Crosier Branch, White Rocks Branch and South Fork of Potts Creek all support native trout populations.

Natural Integrity

Natural processes in the wilderness have been impacted through human action in the form of a 48-acre harvest cut (which occurred in 1975), 4.2 miles of old logging roads and .9 mile of road and power line currently still being used to service two private inholdings of land (respectively 3 and 28 acres in size).

Apparent Naturalness

Past activities of human presence is evident in the form of logging roads and timber cuts which are readily apparent. Natural processes are at work in reclaiming these areas but it will take a period of time for these impacts to gain a natural appearance.

A jeep trail exists along the southern boundary and provides access to private inholdings and to a power line which also accesses the private land. As long as these facilities are being used, there will be a contrast in the natural surroundings which will be readily evident to wilderness users.

Outstanding Opportunities for Solitude

Opportunities for solitude can be obtained to a moderate degree by topographic features and vegetative screening in the wilderness. In the northern part of this wilderness around Potts Creek Drainage, solitude is moderately compromised by the sound of vehicular traffic and the readily available access to the area by old logging roads.

Opportunities For Primitive Recreation

Current use in wilderness consists of hiking, camping, backpacking, hunting, fishing, horseback riding and rock climbing.

Supplemental Wilderness Attributes

Two animal species can be considered unique in this wilderness. The James River Spiny Mussel [Pleurobema (Canthyria) collina] is found in Potts Creek and Johns Creek and is on the Federal Endangered list. The Green Salamander (Aneides aeneus) is a sensitive species. Mountain Lake Wilderness is typical of the habitat normally occupied by this salamander.

Shenandoah National Park - Wilderness and Natural Zone

General Environment

One wilderness which consists of eight separate parcels of land and a Natural Zone are located within the AIPM project boundary on the Shenandoah National Park. These areas total approximately 267,995 acres of park land in Albemarble, Augusta, Greene, Madison, Page, Rappahannock and Rockingham Counties, Virginia. These areas are characterized by mountainous terrain covered with second growth deciduous forest. Various age classes are found throughout the areas and species composition is mixed, although the majority of the area can be classified as upland oak. Elevations range from 1,500 feet along the edge of the park boundary to approximately 4,000 feet at the summit of the Blue Ridge Mountains.

Natural Integrity

Most of the areas were utilized by humans prior to the establishment of the National Park in 1936. However, nearly all the signs of human presence have vanished from the areas and most natural processes are now functioning relatively unimpaired by human influence.

Apparent Naturalness

The areas are second growth eastern deciduous forest that appear natural. Trails, old home sites, memorials, plaques, fire rings, etc. were present before wilderness designation and can be considered as part of the natural environment.

Outstanding Opportunities for Solitude

Even though these areas are relatively small in size, they provide a high degree of solitude. This is primarily a result of the density of vegetation which screens the user from sights and sounds of adjacent land use and the topographic features of the mountainous terrain which provide secluded coves.

Opportunities for Primitive Recreation

Primary recreational uses of the areas are camping, hiking, backpacking and fishing. At the height of the Park's backcountry visitation in 1978, these areas had the highest density of use of all National Park Service areas. Although visits have tapered off in recent years, these areas are still extremely popular.

Supplemental Wilderness Attributes

Some of the best examples of specific geologic features in North America can be found in these areas.

Scenic Values

Significant scenic values can be found in the waterfalls and cascades which occur along the numerous streams in the area. Rock cliffs, rugged mountains peaks and an abundance of wildflowers and wildlife contribute to the scenic diversity of these areas.

Scenic Values

The wilderness is typical of the surrounding forest environment and does not deviate from the natural characteristic landscape.

ENDANGERED AND THREATENED SPECIES BIOLOGICAL EVALUATION

APPENDIX B

APPENDIX B

ENDANGERED AND THREATENED SPECIES BIOLOGICAL EVALUATION

All AIPM planned, funded, executed or permitted programs or activities will be reviewed for possible effects on endangered, threatened, proposed or sensitive species. This review (biological evaluation) shall consider all available information on distribution, habitat requirements, biology and all other pertinent facts in determining effects of AIPM programs or activities on these species.

This appendix displays information used in developing a list of endangered, threatened or proposed species for the AIPM program area, (Table III-3). Identification of potential adverse effects and where opportunities exist to take steps to remove the potential for adverse effects are presented. These steps are the basis for developing mitigating measures for endangered, threatened or proposed species for the AIPM project area (see chapter II, Mitigating Measures).

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Suite 322
315 South Allen Street
State College, Pennsylvania 16801

September 1, 1988

Mr. John E. Alcock
Regional Forester
U.S. Forest Service
1720 Peachtree Road, NW
Atlanta, Georgia 30367

Dear Mr. Alcock:

We have reviewed your request of August 4, 1988, regarding federally designated endangered, threatened, or proposed species found in the West Virginia portions of the Monongahela and George Washington National Forests. The Service offers the following comments.

The correct scientific name for the gray bat should read *Myotis grisescens*. There is some question whether this species exists in the project area. As yet the Cheat Mountain salamander has not been officially *proposed* for listing. The Cheat Mountain salamander is presently considered Category 1. In the plant category, add harparella, *Ptilimnium nodosum*, as a proposed species. The remainder of your list is correct in regard to the West Virginia portion of the project area.

In addition to the federally listed endangered, threatened, or proposed species, the Service encourages federal agencies to take the following fish, wildlife, and plant taxa into account in the planning process. Although these taxa do not receive substantive or procedural protection pursuant to the Endangered Species Act of 1973, they are under consideration for possible listing.

Category 1 comprises taxa for which the Service currently has substantial information on hand to support the biological appropriateness of proposing to list as endangered or threatened (i.e., Cheat Mountain salamander). Proposals have not yet been issued because they have been precluded at present by other listing activities.

Category 2 comprises taxa for which information now in possession of the Service indicates that proposing to list may be appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support proposed rules.

The following is a list of taxa being considered in the West Virginia portion of your project area. Many of these also occur in similar habitats in Virginia:

VERTEBRATES

Scientific Name	Common Name
Category 1	
Plethodon nettingi	Cheat Mountain salamander
Category 2	
Phenacobius teretulus	Kanawha minnow
Rhinichthys bowersi	Cheat minnow
Etheostoma osburni	Finescale saddled darter
Percina macrocephala	Longhead darter
Cottus sp.	Bluestone sculpin
Cryptobranchus alleganiensis	Hellbender
Aneides aeneus	Green salamander
Gyrinophilus subterraneus	West Virginia spring salamander
Plethodon punctatus	White-spotted salamander
Crotalus horridus horridus	Timber rattlesnake
Thryomanes bewickii altus	Appalachian Bewick's wren
Lanius ludovicianus migrans	Migrant loggerhead shrike
Aimophila aestivalis	Bachman's sparrow
Sorex palustris punctulatus	Southern water shrew
Sorex dispar	Long-tailed shrew
Microsorex hoyi thompsoni	Northeastern pygmy shrew
Condylura cristata parva	Star-nosed mole
Myotis subulatus leibii	Eastern small-footed bat
Plecotus rafinesquii	Southeastern big-eared bat
Sylvilagus transitionalis	New England cottontail rabbit
Neotoma floridana magister	Eastern woodrat
Microtus chrotorrhinus carolinensis	Southern rock vole

PLANTS

Category 1	
Arabis serotina	Shale barren rock cress
Category 2	
Allium oxyphilum	Shale barren onion
Carex polymorpha	Variable sedge
Euphorbia purpurea	Darlington's spurge
Ilex collina	Long stalked holly
Marshallia grandiflora	Barbara's buttons
Paxistima canbyi	Canby's Mountain lover
Polemonium vanbruntiae	Jacob's ladder

Saxifraga caroliniana	Gray's saxifrage
Scutellaria ovata spp. _pseudoarguta_	Hearted-leaved skullcap
Taenidia montana	Mountain pimpernel
Thalictrum steeleanum	Steele's meadow rue
Trifolium virginicum	Kate's Mountain clover
Trillium pusillum var. _monticulum_	Dwarf trillium

Sincerely,

Charles J. Kulp

Charles J. Kulp
Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE
DIVISION OF ECOLOGICAL SERVICES
1825 VIRGINIA STREET
ANNAPOLIS, MARYLAND 21401

August 22, 1988

Mr. John E. Alcock
Regional Forester
Forest Service Regional Office
1720 Peachtree Road, NW
Atlanta, GA 30367

Dear Mr. Alcock:

This responds to your August 4, 1988, request for information on the presence of species which are Federally listed or proposed for listing as endangered or threatened within the Appalachian Integrated Pest Management Gypsy Moth Project Area in Virginia and West Virginia. We understand that pesticides to be used in this project are: Gypchek, Luretape, Bt, and Dimilin. We have reviewed the information you enclosed and are providing comments in accordance with Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). The following listed and proposed species may be present in the concerned area:

Birds		
Falcon, American peregrine	*Falco peregrinus anatum*	E
Eagle, bald	*Haliaeetus leucocephalus*	E
Mammals		
Squirrel, Virginia n. flying	*Glaucomys sabrinus fuscus*	E
Bat, Virginia big-eared	*Plecotus townsendii virginianus*	E
Bat, Indiana	*Myotis sodalis*	E
Amphibians		
Salamander, Cheat Mountain	*Plethodon nettingi*	PT*
Salamander, Shenandoah	*Plethodon shenandoah*	PE*
Invertebrates		
Isopod, Madison Cave	*Antrolana lira*	T
Mussel, James spiny	*Pleurobema* (*Canthyria*) *collina*	E
Mussel, tuberculed blossom pearly	*Epioblasma t. torulosa*	E

Fish

Logperch, Roanoke	*Percina rex*	PE*

Plants

Clover, running buffalo	*Trifolium stoloniferum*	E
Pink, swamp	*Helonias bullata*	PT
Rockcress, smooth	*Arabis serotina*	PE*

* The proposals for these species have not yet been published in the Federal Register but they are to be proposed in the near future.

Some information on the distribution of these species is provided in the enclosed handouts.

Impacts of this project appear most likely to result from direct effects of Dimilin on the invertebrates and indirect effects on bats and the Roanoke logperch resulting from loss of their prey organisms (insects). The most vulnerable of the invertebrates appears to be the Madison Cave isopod. We recommend that spraying of Dimilin be avoided in the area recharging the groundwater aquifer which it inhabits.

The Virginia big-eared bat is probably the most vulnerable of the endangered vertebrates in the project area. Because the majority of all Virginia big-eared bat maternity colonies are within the study area and because lepidoptera are the predominant groups preyed upon by this species, evaluation of potential effects on this bat is particularly important. Results of studies currently underway to define the prey species and feeding habitats of the Virginia big-eared bat should assist the Forest Service in evaluating effects of gypsy moth spraying on this endangered species.

Rare crustaceans and insects may be particularly vulnerable to the spraying of Dimilin. Candidate species (those placed under review in the Federal Register to determine suitability for listing) in these groups occurring in the project area include:

Crustacea

Burnsville Cove cave isopod	*Stygobromus conradi*	Bath Co., VA
Morrison's cave isopod	*Stygobromus morrisoni*	Bath, Highland Cos., VA Hardy, Pendleton Cos., WV
Bath County cave amphipod	*Stygobromus mundus*	Bath, Alleghany Cos., VA
New River riffle crayfish	*Cambarus chasmodactylus*	New River drainage, VA, WV

INSECTS

Mayflies

West Virginia burrowing mayfly	*Ephemera triplex*	WV
Dragonflies and Damselflies		
Alleghany snaketail dragonfly	*Ophiogomphus incurvatus alleghaniensis*	WV, VA
Beetles		
Schaum's Blue Ridge ground beetle	*Sphaeroderus shaumi shenandoah*	Stony Man Mtn, Blue Ridge Parkway, VA
Six-banded longhorn beetle	*Dryobius sexnotatus*	VA
Maureen's hydraenan minute moss beetle	*Hydraena maureenae*	Bath Co., VA
American burying beetle	*Nicrophorus americanus*	VA
Black lordithon rove beetle	*Lordithon niger*	VA, WV
Butterflies and Moths		
Marbled underwing moth	*Catocala marmota*	VA
Precious underwing moth	*Catocala pretiosa*	VA
Hebard's noctuid moth	*Erythroecia hebardi*	VA
Tawny crescent butterfly	*Phyciodes batesi*	WV
Regal fritillary butterfly	*Speyeria idalia*	VA, WV
Chestnut clearwing moth	*Synanthedon castaneae*	VA

"Candidate" species are not legally protected under the Endangered Species Act and Biological Assessment and consultation requirements pursuant to that legislation do not apply to them. They are included here for the purpose of notifying you of possible future proposals and listings in advance, for consideration in your NEPA review process, and to encourage efforts to avoid adverse impacts to them. Additional information on these candidate species may be obtained by contacting the Virginia Natural Heritage Program (804-786-2121) and the West Virginia Natural Heritage Program (304-636-1767).

This response relates only to endangered species under our jurisdiction. It does not address other Service concerns under the Fish and Wildlife Coordination Act or other legislation.

If you have any questions regarding this response, please contact Andy Moser or Judy Jacobs of my Endangered Species staff.

Sincerely yours,

G. A. Moser

for Glenn Kinser
Supervisor
Annapolis Field Office

enclosures

August 1988

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN VIRGINIA

Common Name	Scientific Name	Status	Distribution
FISHES:			
Chub, slender	Hybopsis cahni	T	Powell River, Lee County; Clinch River downstream of TN line. Critical habitat: Powell River, main channel from the Tennessee-Virginia state line upstream through Lee County; Clinch River, TN-VA state line upstream through Scott County.
Chub, spotfin	Hybopsis monacha	T	North Fork Holston River, Scott and Washington Counties; Middle Fork Holston River, Washington County. Critical habitat: North Fork Holston River, main channel from the Virginia-Tennessee state line upstream through Scott and Washington Counties.
Madtom, yellowfin	Noturus flavipinnis	T	Copper Creek, Scott and Russell Counties; Powell River downstream of TN line. Critical habitat: Powell River, main channel from the Virginia-Tennessee state line upstream through Lee County; Copper Creek, main channel from its junction with Clinch River upstream through Scott County and upstream in Russell County to Dickensville.
Madtom, yellowfin	Noturus flavipinnis	X	Experimental populations are designated in North Fork Holston River, Smyth, Washington and Scott Counties.

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN VIRGINIA

Common Name	Scientific Name	Status	Distribution
Sturgeon, shortnose*	*Acipenser brevirostrum*	E	No recent records. Potentially in Chesa Bay tributaries.
REPTILES:			
Turtle, green*	*Chelonia mydas*	T	Oceanic; summer reside coastal waters, incl Chesapeake Bay.
Turtle, hawksbill*	*Eretomchelys imbricata*	E	Oceanic; summer visito coastal waters.
Turtle, leatherback*	*Dermochelys coriacea*	E	Oceanic; summer visito coastal waters, incl Chesapeake Bay.
Turtle, loggerhead*	*Caretta caretta*	T	Oceanic; summer reside coastal waters, incl Chesapeake Bay; occasionally nests i Virginia Beach, Northampton and Acco Counties.
Turtle, Atlantic ridley*	*Lepidochelys kempii*	E	Oceanic; summer reside coastal waters, incl Chesapeake Bay.
BIRDS:			
Eagle, bald	*Haliaeetus leucocephalus*	E	Entire state - nests i eastern counties.
Falcon, American peregrine	*Falco peregrinus anatum*	E	Entire state - re-esta ment of breeding population to coast mountain sites in progress.
Falcon, Arctic peregrine	*Falco peregrinus tundrius*	T	Entire state- migrato concentration area coast.

August 1988

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN VIRGINIA

ommon Name	Scientific Name	Status	Distribution
Plover, piping	*Charadrius melodus*	T	Accomack and Northampton Counties, Cities of Hampton and Virginia Beach.
Warbler, Bachman's	*Vermivora bachmanii*	E	Extremely rare - no recorded nesting.
Warbler, Kirtland's	*Dendroica kirtlandii*	E	Entire state - occasional migrant.
Woodpecker, red-cockaded	*Picoides borealis*	E	Brunswick, Isle of Wight, Prince George, Southampton, Suffolk, Surry, Sussex, Virginia Beach and York Counties.
AMMALS:			
Bat, gray	*Myotis grisescens*	E	Lee, Scott, and Washington Counties.
Bat, Indiana	*Myotis sodalis*	E	Lee, Wise, Bland, Giles, Botetourt, Montgomery, Alleghany, Bath, Tazewell and Shenandoah Counties.
Bat, Virginia big-eared	*Plecotus townsendii virginianus*	E	Bath, Highland and Tazewell Counties.
Cougar, eastern	*Felis concolor couguar*	E	Historically, entire state; continued existence unconfirmed.
Shrew, Dismal Swamp southeastern	*Sorex longirostris fisheri*	T	Cities of Chesapeake and Suffolk.
Squirrel, Delmarva Peninsula fox	*Sciurus niger cinereus*	E	Accomack and Northampton Counties.
Squirrel, Virginia northern flying	*Glaucomys sabrinus fuscus*	E	Grayson, Highland and Smyth Counties.
Whale, blue*	*Balaenoptera musculus*	E	Oceanic.

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN VIRGINIA

Common Name	Scientific Name	Status	Distribution
Whale, finback*	Balaenoptera physalus	E	Oceanic.
Whale, humpback*	Megaptera novaeangliae	E	Oceanic.
Whale, right*	Eubalaena spp. (All species)	E	Oceanic.
Whale, sei*	Balaenoptera borealis	E	Oceanic.
Whale, sperm*	Physeter catodon	E	Oceanic.
MOLLUSKS:			
Snail, Virginia fringed mountain	Polygriscus virginianus	E	Pulaski County, near Radford.
Mussel, birdwing pearly	Conradilla caelata	E	Powell and Clinch Rivers Lee, Russell, Scott an Wise Counties.
Mussell, green blossom pearly	Epioblasma (=Dysnomia) torulosa gubernaculum	E	Clinch River, Scott County.
Mussel, tan riffle	Epioblasma walker	E	Middle Fork Holston River, Smyth and Washington Counties.
Mussel, fine-rayed	Fusconaia cuneolus	E	Clinch River, Tazewell, Russell, Scott, and Wise Counties; Powell River Lee County.
Mussel, shiny pigtoe	Fusconaia edgariana	E	Powell, Clinch and Holston Rivers, Tazewell, Russell Scott, Wise, Lee, Washington and Smyth Counties.
Mussel, little-winged pearly	Pegias fabula	PE	Clinch River, Tazewell County; North and Middle Forks Holston River, Smyth County.

August 1988

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN VIRGINIA

Common Name	Scientific Name	Status	Distribution
Mussel, Cumberland monkey-face pearly	*Quadrula intermedia*	E	Powell River, Lee County.
Mussel, Appalachian monkey-face pearly	*Quadrula sparsa*	E	Powell River, Lee County; Clinch River, Scott County.
Mussel, pink mucket pearly	*Lampsilis orbiculata*	E	Clinch River, Scott County.
Spinymussel, James	*Pleurobema collina*	E	Craig, Johns, Catawba Creeks, Craig and Botetourt Counties.
ARTHROPODS:			
Isopod, Madison Cave	*Antrolana lira*	T	Augusta County.
Amphipod, Hay's Spring	*Stygobromus hayi*	E	District of Columbia.
PLANTS:			
Birch, Virginia round-leaf	*Betula uber*	E	Cressy Creek, Smyth County.
Pink, swamp	*Helonias bullata*	PT	Augusta, Henrico, and Nelson Counties.
Pogonia, small whorled	*Isotria medeoloides*	E	Appomattox, Buckingham, Caroline, Gloucester, James City, New Kent, and Prince William Counties.
Mallow, Peter's mountain	*Iliamna corei*	E	Giles County.

*Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

PE - Proposed Endangered
E - Endangered
T - Threatened
PX - Proposed Experimental Population

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN WEST VIRGINIA

Common Name	Scientific Name	Status	Distribution
FISHES:			
None			
BIRDS			
Eagle, bald	Haliaeetus leucocephalus	E	Entire state; nests in Grar and Hardy Counties
Falcon, American peregrine	Falco peregrinus anatum	E	Entire state - migratory
Falcon, Arctic peregrine	Falco peregrinus tundrius	T	Entire state - migratory; no nesting
Warbler, Kirtland's	Dendroica kirtlandii	E.	Entire state - occasional migrant
MAMMALS			
Bat, Indiana	Myotis sodalis	E	Entire state - known hibernacula in Tucker, Pocahontas, Preston and Pendleton Counties - critical habitat Hellhole Cave, Pendleton County
Bat, Virginia big-eared	Plecotus townsendii virginianus	E	Primarily northeastern, especially Pendleton, Tucker and Grant Counties Critical habitat Hellhole Cave, Cave Mountain Cave, Hoffman School Cave, ad Sinnit Cave in Pendleton County; Cave Hollow Cave in Tucker County
Squirrel, Virginia northern flying	Glaucomys sabrinus fuscus	E	Pocahontas, Pendleton and Randolph Counties
Cougar, eastern	Felis concolor couguar	E	Historically, entire state; continued existence unconfirmed

August 1988

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN WEST VIRGINIA

Common Name	Scientific Name	Status	Distribution
MOLLUSKS			
Snail, flat-spired three-toothed land	Triodopsis platysayoides	T	Monongalia County
Mussel, tuberculed-blossom pearly	Epioblasma (=Dysnomia) torulosa torulosa	E	Kanawha River, Fayette County
Mussel, pink mucket pearly	Lampsilis orbiculata	E	Kanawha River, Fayette County and Ohio River, Cabell County
Mussel, James spiny	Pleurobema collina	E	Potts Creek, Monroe County
PLANTS			
Clover, running buffalo	Trifolium stoloniferum	E	Alluvial plains, Fayette and Webster Counties
Harperella	Ptilimnium nodosum	PE	Morgan County

E = Endangered
T = Threatened
PE = Proposed Endangered
PT = Proposed Threatened

Table B-1.--Biological evaluations of Federally-listed, proposed or category 1 species known to occur in AIPM Project Area.

Virginia Northern Flying Squirrel

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
habitat	gypsy moth outbreaks	-changes in forest structure and composition	Project Environmental Assessment
		-possible reduction of food supplies	Project Environmental Assessment

Virginia Big-eared Bat and Indiana Bat

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
food supply	gypsy moth outbreaks	-possible reductions of some food supplies	Project Environmental Assessment
food supply	Bt or diflubenzuron	-reductions of some food supplies	Project Environmental Assessment

Bald Eagle

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
nest sites	gypsy moth outbreaks	-habitat alteration during critical nesting periods	Project Environmental Assessment
nest sites	aerial applications	-disturbances during critical nesting periods	Mitigation Measures - AIPM EIS
nest sites	other human activities	-disturbances during critical nesting periods	Mitigation Measures - AIPM EIS

Peregrine Falcon

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
eyries	human activities	-disturbance	Project Environmental Assessment

Table B-1.--Biological evaluations of Federally-listed, proposed or category 1 species known to occur in AIPM Project Area (continued).

Cheat Mountain and Shenandoah Salamanders

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
habitat	gypsy moth outbreaks	-changes in habitat suitability	Project Environmental Assessment

Flat-spired Three-toothed Snail

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
physiology	diflubenzuron	-unknown	Mitigation Measures - AIPM EIS

Madison Cave Isopod

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
water quality	gypsy moth outbreaks	-defoliation related effects on water quality	Project Environmental Assessment
physiology	diflubenzuron	-unknown	Mitigation Measures - AIPM EIS

Plants (Harperella, Running Buffalo Clover, Shale Barren Rockcress, Swamp Pink)

Potential adverse effects on:	from:	how:	Effects analyzed and measures established in:
physiology	gypsy moth outbreaks	-unknown effects of defoliation	Project Environmental Assessment
habitat	gypsy moth outbreaks	-changes in site conditions	Project Environmental Assessment
individuals	human disturbance	-trampling	Mitigation Measures - AIPM EIS

PLAIN LANGUAGE SUMMARY OF THE HEALTH RISK ANALYSIS FOR DIFLUBENZURON

APPENDIX C

APPENDIX C

PLAIN LANGUAGE SUMMARY OF THE HEALTH RISK ANALYSIS FOR DIFLUBENZURON

INTRODUCTION

This appendix is extracted from the plain language addendum of the Gypsy Moth Suppression and Eradications Projects, Final Environmental Impact Statement. For detailed information on how the risks were calculated or methods used, the reader is referred to Appendix F of the FEIS.

OVERVIEW

Only one chemical insecticide, diflubenzuron, is being considered for use in the AIPM projects to suppress gypsy moths. Appendix C analyzes the risk to human health of using diflubenzuron.

This appendix is for the general reader. It describes the methods and results of the risk analysis in words that can be understood by decision-makers and the public. Readers who want to check the mathemathics or see what studies were used should refer to the Final Environmental Impact Statement, Appendix F (USDA FEIS 1985).

Conclusions

The chemical being considered is diflubenzuron. The basic question being asked in the risk analysis is, would human health be affected by use? Briefly, the answer is as follows:

1. All realistic doses to the general public from routine spraying would be unlikely to pose any significant risks of adverse effects, based on evaluations of this chemical made by the Environmental Protection Agency (EPA) or the World Health Organization.

2. All exposures from routine operations would be well below levels that could cause birth defects in the general population.

3. Realistic doses to workers from routine operations would have no ill effects.

4. The estimated doses from abnormally high exposures (worse case doses) in routine operations would be below the "safe" levels. That is, they would be below the acceptable daily intake levels.

5. Some people who are unusually sensitive to chemicals could be affected by the routine spraying of diflubenzuron. These people should be warned of possible harm before spraying takes place.

6. In most cases, aircraft spills would have no lasting effects on human health.

7. The odds of a person getting cancer from routine operations are estimated to be one in a billion.

8. The total added risk of cancer from routine operations would be 0.05 incidence per year in the exposed population of 5.4 million people. This figure is based on the amounts that have been sprayed in the past.

9. It is extremely unlikely that spraying projects would result in mutations that could be passed to offspring.

Method

These conclusions were reached by using a three-step process used in most risk analyses:

1. Hazard Identification

   a. What are the toxic (poisonous) properties of the chemical?

   b. What doses are deemed safe for humans?

   c. What doses might cause harm?

   Most of this information comes from laboratory tests that used mammals. Other sources include studies of human poisonings and research involving other organisms.

2. Exposure Analysis

   a. Who is likely to be exposed as a result of spraying?

   b. How much of the chemical is likely to enter their bodies?

   c. How often will they be exposed?

   People can be exposed in several ways and can take in different amounts of the chemical. The exposure analysis describes the ways people might be exposed. These situations, called "scenarios", range from properly handled routine operations, through the worst cases that could occur during routine applications, to accidental spills of chemical concentrates. These scenarios cover a wide range of possible exposures so any real life exposure should be close to or less than these.

3. Risk Evaluation

   a. How will human health likely be affected by actual spraying operations?

      This is answered by comparing the results of the first two steps. That is the estimated doses (the amounts that might enter people's bodies) in the different exposure scenarios are compared with the doses found to be safe or harmful to health.

   It must be remembered that exposure to insecticides almost always involves some element of risk. Therefore, the risk evaluation discusses degrees of risk (or the odds that significant risks will or will not occur) rather than absolute safety versus unacceptable risks.

Use of Worst Case Assumptions

Whenever there is doubt about what might happen when the chemical is used, this analysis assumes the worst. For instance, if there is doubt that diflubenzuron can cause cancer, this analysis makes the worst case assumption that it can. Another

example is that all standard application rates are increased by 10 percent to account for normal variations in preparing and spraying the chemical. In the worst case scenarios, these rates are increased by 100 percent to account for possible major errors in mixing and spraying. It is also assumed that a person might eat fruit or vegetables that contain spray residues, even though spraying is done some time before most fruit and vegetables would be harvested. Further, the amount of food in an exposed person's diet is assumed to be greater than it is in the average diet.

Together, the worst case assumptions help ensure that health risks will not be understated. But in doing so, they probably suggest that the spraying projects pose greater risks than are likely. In other words, the risks listed above probably are exaggerated. For example, use of worst case assumptions suggests that there is a small risk of cancer occurring. Yet there is no evidence that diflubenzuron can cause cancer in humans or other vertebrates at any dose levels.

The following sections discuss the methods and conclusions of the health risk analysis in greater detail.

HAZARD IDENTIFICATION

Determining Toxicity

The first step in the risk analysis is to determine the toxicity of diflubenzuron. Toxicity is the ability of a substance to harm health.

Diflubenzuron has been studied in the laboratory using conventional toxicity tests on animals. It is standard practice in the health field to use the results of such tests to help determine hazards to people. This is because different animals, including humans, often react similarly when given similar doses of a substance. But this is not always the case. Therefore, good judgment and care must be used when applying the results of animal tests to humans.

Health effects caused by toxic chemicals fall into two groups: threshold responses and nonthreshold responses. Most obvious effects, such as birth defects and nervous disorders, seem to fall into the first group. Cancer and mutations (changes in body cells) fall into the second group. But it is not the types of diseases that separate the two groups. Rather, it is the way in which the responses occur.

With threshold responses, there is a certain amount of the substance that can enter the bodies of most animals or humans without causing any harm. The dividing line between doses that have no effects and those that do is the threshold level. Once the threshold is crossed, increased doses will increase the intensity and extent of the effects. In theory at least, these types of responses are fairly predictable and similar in all healthy people.

With nonthreshold responses, any dose might set off a reaction, but there is no certainty that it will do so. There will be an adverse effect only if the chemical successfully invades the body and reaches certain strategic points, such as the DNA in human cells. It is possible for a large dose of the substance to enter a person's body without any effect at all. But the greater the lifetime dose, the greater the odds of seeing these effects.

Threshold Responses

Animals and people do not show threshold responses until certain doses are exceeded. Therefore, to assess health risks from a chemical, it would seem necessary to find

out its threshold dose. That is, how much of the chemical will the body tolerate before there are ill effects. This threshold dose cannot be known precisely without running a seemingly endless series of tests using slightly different doses. So toxicologists instead focus on the highest doses that are known to cause no ill effects. These doses are called no-observed-effect levels (NOELs).

No-observed-effect levels for chemicals are determined in standard, controlled lab tests. In these tests, a population of animals (such as mice of roughly the same age) is separated into groups. Each group then is given a different daily dose of the substance for an extended period of time. The highest does that has no apparent ill effects is the NOEL.

To compare doses given to different species or different sized animals, a common unit is needed for measuring doses. Sometimes doses are based on body weight. At other times, doses are based on the surface area of the body. In this study, doses are expressed as fractions of body weight. The standard unit is milligrams (of chemical) per kilogram (of body weight). One kilogram is equal to 2.2 pounds, while a milligram weighs one million times less. When the dose is given daily, as is the case with most NOELs, the unit is milligrams per kilogram per day (mg/kg/day).

There may be several NOELs for each chemical--both for different species and different responses. While different species of mammals, including humans, tend to respond similarly to the same dose of a chemical, they do not respond identically. Furthermore, toxicity tests often look for specific types of responses (such as birth defects) and might overlook others. Figure C-1 shows a hypothetical example of a substance with several NOELs. This hazard analysis tried to focus on the lowest NOEL for diflubenzuron to make sure that risks would not be understated.

As suggested in figure C-1, once the dose of a substance exceeds the NOEL and crosses the threshold, the effects tend to increase as the dose increases. The increase in effects can take two forms; an increase in intensity (such as increasing kidney problems), or the addition of new types of effects (for example, birth defects in addition to kidney problems). The first effects might be relatively mild and, even then, result only after long-term exposure. But as the dose increases, the effects would become more severe.

The most severe effect from a toxic substance is death, with the most extreme effect being death from a single (acute) exposure. The one-time or short-term dose that kills 50 percent of a group of treated lab animals is called the LD_{50} (for "lethal dose, 50 percent"). An oral LD_{50} is the lethal dose from swallowing a chemical. A dermal LD_{50} is the lethal dose on unbroken skin. Clearly, a person would be at great risk if exposed to a substance at a level near its LD_{50}.

Because of biological differences between test animals and humans, NOELs cannot be responsibly applied to humans without using a safety factor. That is, to err on the side of caution, NOELs from animal studies usually are reduced by a safety factor to set safe doses for humans. The most common safety factor is 100, but it can range from 10 to 1,000. The U.S. Environmental Protection Agency and the World Health Organization both use safety factors to establish safe doses for various chemicals. For each chemical, the safety factor used depends on how sure they are that the available studies can be applied to humans. The term they use for safe dose is "acceptable daily intake (ADI)." The ADI is believed to be the maximum dose of the chemical that can be taken every day over a person's lifetime without any adverse effects. Figure C-2 shows the relationship between NOELs, ADIs and LD_{50}s. ADIs are the starting points used to evaluate the health risks associated with each chemical. If the exposure analysis shows that the expected dose to humans will be

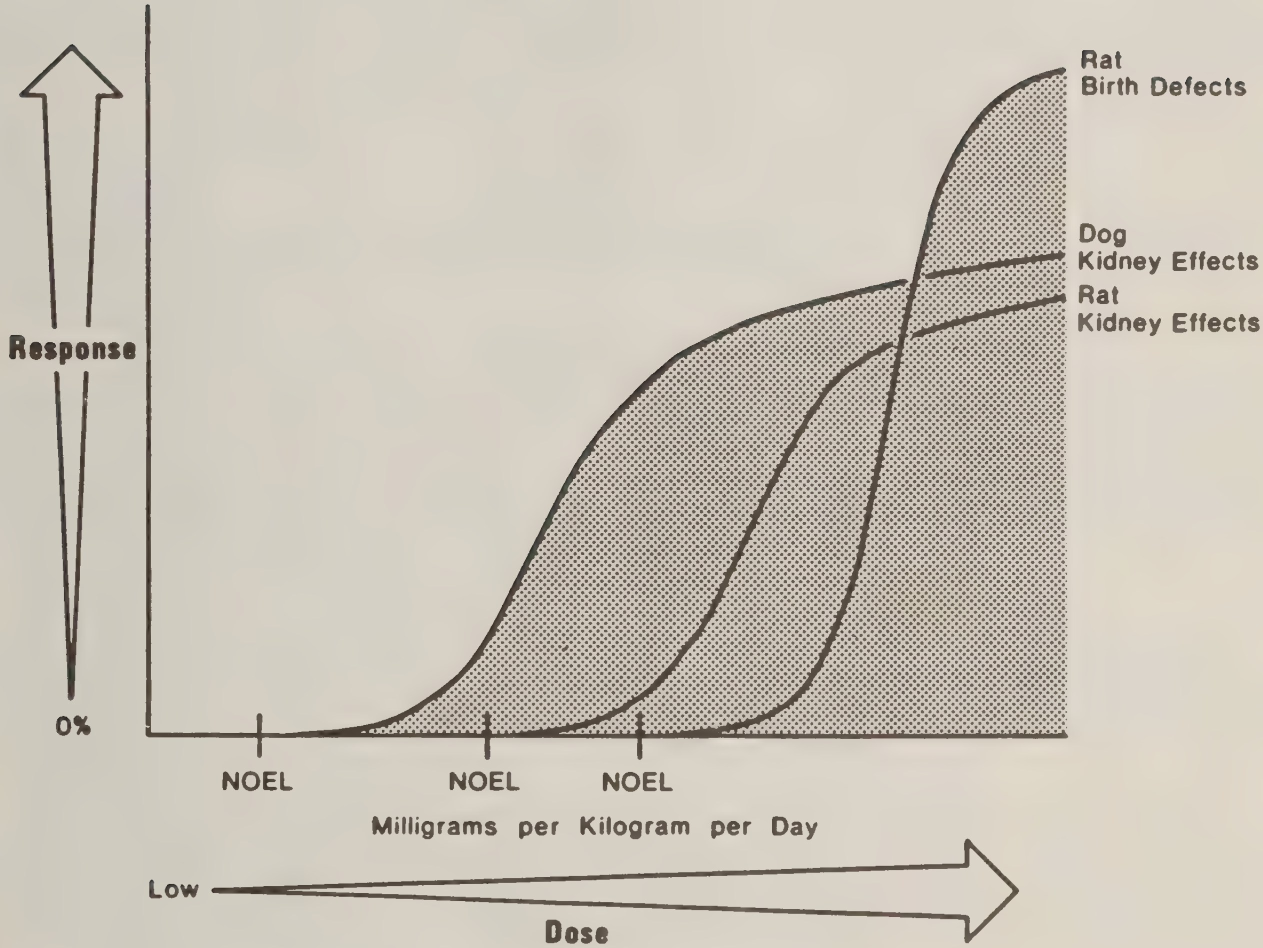


Figure C-1.--Typical dose-response pattern fromthreshold responses. This example shows a chemical with three no-observed-effect levels (NOELs). The lowest NOEL is for kidney effects in dogs. The intensity of this effect increases as the dose increases. Even larger doses could result in birth defects in addition to kidney problems. (The two NOELs for kidney effects show how one species might be more sensitive than another to the same chemical.

LD_{50} - Acute lethal dose. One-time or short-term dose that is lethal to 50 percent of treated animals.

Threshold - Long-term dose level at which adverse effects first occur.

NOEL - No-observed-effect level. Long-term dose that does not result in apparent adverse effects in test animals.

Safety Factor - Factor applied to the NOEL to set safe lifetime dose to humans.

ADI - Acceptable daily intake. Maximum dose that a person could safely take every day throughout lifetime without harm to health.

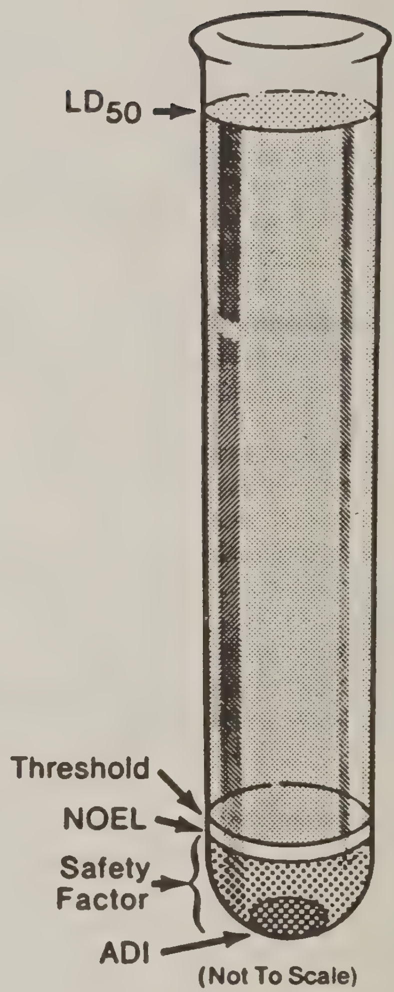


Figure C-2.--Relationship between doses seen in laboratory tests and established safe doses (acceptable daily intakes) for humans.

less than the ADI, then the dose is considered safe for most people. For doses above the ADI, it is necessary to look more closely at the data about the chemical. Specifically, it is necessary to determine the margin of safety--that is, to see how close the dose is to the various NOELs. It is necessary to look at the type of responses that might be involved. If the expected dose occurred every day for a long period and approached the NOEL for a harmful response that is not easily cured, then the safety margin would be small and the health risk might be great. In such situations, a responsible decision-maker would want a high margin of safety before using the chemical. It must be kept in mind that the NOELs used in this analysis are from studies that involve daily exposure over a long time. Also, ADIs are considered to be doses that can be taken safely every day for an entire lifetime. Yet most potential exposures from gypsy moth projects are one-time or short-term exposures. Therefore, comparing the estimated exposures to ADIs and NOELs might not give a true picture of the risks involved. Any error would overstate the risks.

Nonthreshold Responses

Scientists do not all agree about the link between human exposure to chemicals and the occurrence of mutations or cancer. But generally it is thought that no threshold levels are involved.

Cancer. Doctors usually do not speak of degrees of cancer; a person either has cancer or does not. The chance of getting cancer has been compared to the chance of being hit by a car when crossing a road blindfolded. Even if there is only one car within 100 miles, there is a small chance it will hit. If there are two cars, the chances will be greater, and so on. Likewise, the odds of getting cancer from a known carcinogen (cancer-causing substance) increase with the size and duration of the dose.

Hazard assessments for cancer have two steps. The first is to see if there is evidence that a chemical could cause cancer. The second is to find the odds of getting cancer from different doses. Since there are no known cases of human cancer being caused by diflubenzuron, data on animals were used. A mathematical model was used to determine its cancer potency.

Various models (or formulas) can be used to determine cancer potency. For this study, a simple linear model was used. The linear model assumes that a steady increase in dose will result in a steady increase in the odds of getting cancer. This model is overly simplistic, but it usually errs on the side of overstating the chances of cancer occurring.

The linear model also assumes that a given total dose will have the same effect no matter what the dosing period is. For example, a large dose given on one day is assumed to have the same effect as the same total dose given in smaller amounts over several days. However, this may not always be the case. So this assumption puts some uncertainty into the risk analysis.

An example of the assumed linear relationship between a dose of a specific substance and the chance of cancer is shown in figure C-3. To show how the linear model overstates the effects of low doses, the graph includes a curve that is closer to known cancer potencies.

The straight-line slope in figure C-3 represents cancer potency. It shows that the increase in cancer probability is for each increase in dose. If the slope were steeper, then the cancer potency would be greater. The potency slope also can be

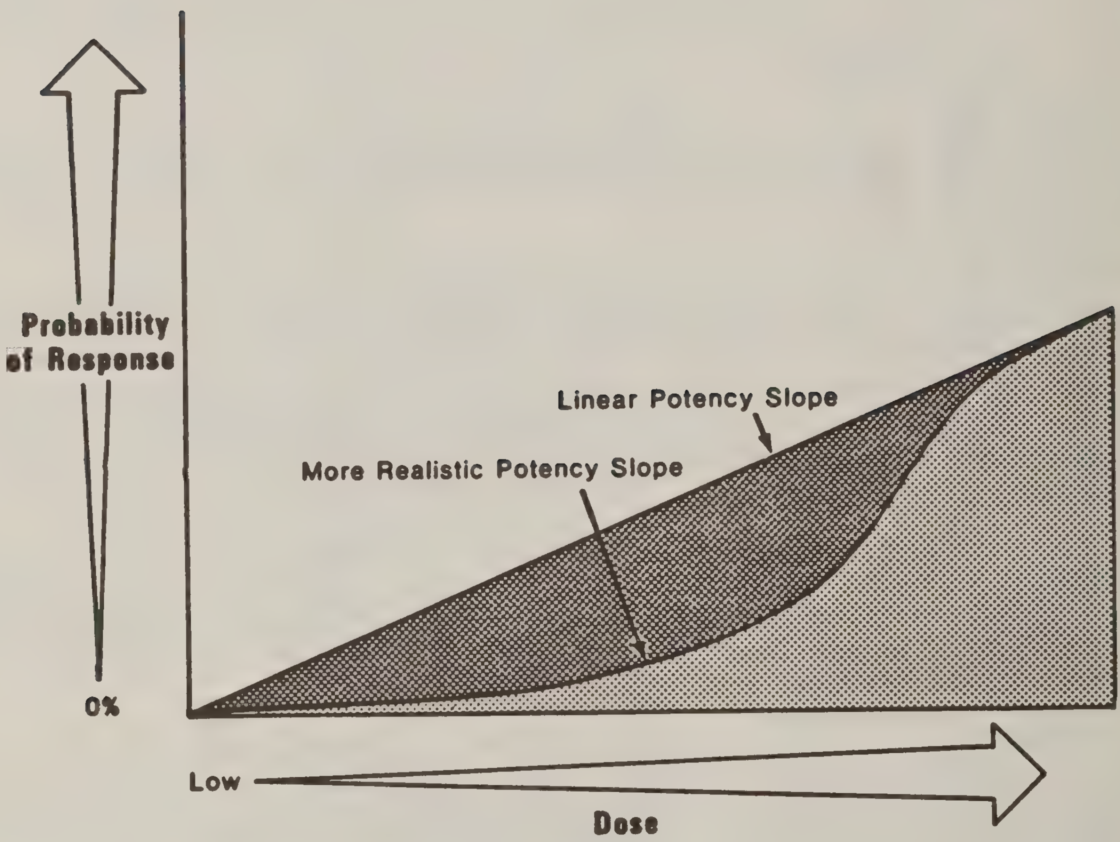


Figure C-3.--Relationship between dose and probability of cancer assumed in linear model. The curved line represents a more realistic potentency slope. The darker shaded area suggests how the linear model overstates the effect of low doses.

expressed as a number; the higher the number, the more potent the carcinogen. Because potency slopes and values can be difficult to grasp, this summary also indicates that a daily dose of diflubenzuron would result in a one in a million chance of getting cancer.

Heritable Mutations. Cancer is the end result of a multi-step process that starts with mutations (changes) in body cells. Changes in most body cells might lead to cancer. But changes in most cells cannot be inherited by offspring. Cells involved in reproduction--called germ cells--are another matter. Mutations in these cells can be inherited. Some of these changes may be minor, but others can be quite serious.

At this time, there are no generally accepted mathematical models for determining the risk of mutations. Instead, scientists weigh the evidence from various laboratory tests to try to assess the ability of a chemical to cause mutations in humans. Such a "qualitative" picture is incomplete; it indicates whether the chemical can cause heritable mutations (those that can be passed to offspring), but it cannot quantify the risks for humans.

However, it may be safe to assume that the risk of heritable mutations would be no greater than the risk of cancer. The mechanisms that distinguish cancer development from the development of mutations are not fully understood. Various factors have been identified that could cause cancer or heritable mutations. The main difference is that substances that cause cancer have many more possible targets in the body. While cancer is caused by changes in any cell, heritable mutations are caused only by changes in germ cells. Thus, use of the linear cancer model (which overstates the risk of cancer) to estimate the risk of heritable mutations would grossly overestimate such risks.

Hazard Levels of Diflubenzuron

Diflubenzuron is currently registered by the Environmental Protection Agency for the control of gypsy moth larvae. This means that, in EPA's judgment, available studies indicate that diflubenzuron is not likely to cause unreasonable adverse effects in people or the environment when properly used.

The acceptable daily intakes, no-observed-effect levels, and acute lethal doses are presented in table C-1. The following subsection summarizes the toxic properties of diflubenzuron. (More detailed information can be found on pages 61 to 64 of the FEIS, on pages F-12 to F-22 of Appendix F, and on pages I-1 to I-22 of appendix I) (USDA FEIS 1985).

Threshold Responses. Diflubenzuron is selective in its toxicity. It causes the outside skelton of insects to rupture when they molt. It is considered to be only slightly toxic to humans. There is no evidence that diflubenzuron causes birth defects. The main health concern is that diflubenzuron is known to raise the levels of sulfhemoglobin and methemoglobin in blood. This effect could impair the bloodstream's ability to carry oxygen. Based on the results of a long term (2-year) feeding study on rats, the EPA has raised the ADI from 0.011 to 0.02 mg/kg/day.

In the rat study, the highest dose at which <u>no</u> methemoglobinia was observed was 40 mg/kg(=2 mg/kg body weight). Additional studies in cats and dogs have confirmed

Table C-1.--Comparison of no-observed-effect levels, acceptable daily intakes, acute lethal doses, and cancer potencies of diflubenzuron used in the risk analysis.

Benchmark	Diflubenzuron
	Milligrams per kilogram of body weight
Dermal LD_{50}	2,000[a]
	Milligrams per kilogram of body weight per day
Lowest NOEL	1.1[a]
Lowest Birth Defect NOEL	4,000[a]
ADI	0.02
One-In-A-Million Cancer Probability[b]	0.000052
	Per milligram per kilogram per day over a lifetime
Cancer Potency	0.019[c]

[a]Highest dose tested; actual number would be higher.

[b]Lifetime daily dose that would result in a one-in-a-million chance of person getting cancer from this chemical alone.

[c]Diflubenzuron itself is considered to be noncarcinogenic; statistic is for 4-chloroaniline, which can be produced when diflubenzuron breaks down.

this figure. This NOEL was used to calculate the current ADI in man (0.02 mg/kg/day), using an additional safety factor of 100. For a 154-pound person, this "safe dose" would be 1.40 milligrams per day.

Nonthreshold Responses. Laboratory studies indicate that diflubenzuron does not cause mutations or cancer. But there might be some risk of cancer associated with exposure to this chemical because one of its breakdown products, 4-chloroaniline, might cause cancer. The evidence about 4-chloroaniline is suggestive, not conclusive. But this analysis makes the worst case assumption that 4-chloroaniline can cause cancer in humans. The cancer potency (calculated in Appendix F, USDA FEIS 1985) would range from 0.0036 to 0.034. Based on a potency of 0.019 (a midpoint average for cancer potency), a 154-pound man would have to be exposed to about 0.0036 milligram of 4-chloroaniline per day throughout his life to have a one-in-a-million chance of getting cancer from this chemical. For diflubenzuron to be the source of this exposure, something like the following would need to occur: every day of his life, the man would have to eat an entire fish that had been exposed to 0.01 milligram of diflubenzuron.

Exposure Analysis

For an insecticide to cause harm to a person, two conditions must be met. First, the substance must be in the person's environment. Second, it must enter the body. Exposure to an insecticide must come from the air that a person breathes, the water the person drinks, or the food the person eats, or the chemical must come into contact with the skin. The amount of chemical in a person's environment is the exposure level.

If the chemical is in the air, it can enter the body through the air passages and lungs (called the inhalation route). If it is on a person's clothes or skin, it must pass through the skin to enter the body (the dermal route). A chemical also could get into the body if the person eats food or drinks water that has insecticide residues (the ingestion, oral, or dietary route). The total amount that actually enters the body is called the dose.

In gypsy moth projects, two groups of people can be exposed. The first group is workers. This group includes supervisors, pilots, truck driver, mixer/loaders, and observers (including inspectors, scouts, rangers, and ecologists). The second group includes members of the general public living in or near sprayed areas.

To find out how much of the chemical these groups could be exposed to, all likely ways a person could be exposed were identified. Then doses from these exposure routes were estimated using standard methods and assumptions. These doses, along with information from the hazard identification section, are used in the risk evaluation section to assess the health risks to workers and the public from exposure to the insecticides.

Possible Routes of Exposure

To cover most ways a person could be exposed, a set of situations, called "scenarios," is used. These range from situations that possibly could occur during routine spraying operations to an unlikely event, such as accidental spills.

Exposures from Routine Spraying Operations

Workers and the public can be exposed to the insecticides in two ways: directly and indirectly. Direct exposures are when the chemical comes into contact with the skin or a person breathes the spray. As discussed on page F-34 of Appendix F (USDA FEIS 1985), inhalation exposures from spraying operations are insignificant. Thus, observers who happen to be under the spray plane or mixer/loaders who splash the chemical on their hands would get direct exposures. Direct exposure also can come from spray drift.

Indirect exposure comes from touching sprayed things like yard furniture or tools that have residues on them. Indirect exposure also can come from eating meat or vegetables or drinking water that have insecticide residues. Figures C-4 and C-5 show the possible routes of exposure from routine operations.

Exposures from Accidents

The highest exposures to workers and residents could come from large amounts of insecticide accidentally spilled from an aircraft (an airplane or helicopter) or a truck. If the mixture is spilled onto a person, the primary route of exposure would be through the skin. If it is spilled into a stream or other body of water, the

Exposure Scenario	Routes of Exposure
Mixer/loaders	All routes of exposure (dermal, inhalation, and ingestion).
Observers	All routes of exposure.

Figure C-4.--Possible routes of exposure to workers from routine gypsy moth control projects.

Exposure Scenario	Routes of Exposure
Direct	Dermal and inhalation exposure from being outside during a spray operation plus dermal exposure from contact with things like plants, grass, or outdoor furniture.
Indirect	No direct dermal exposure (person is inside during spraying) but indirect exposure from contact with items that have insecticide residues.
Dietary	Ingestion exposure from eating about a pound of fish or meat, a pound of vegetables or fruits, and drinking about a half gallon of water--all of which have insecticide residues.

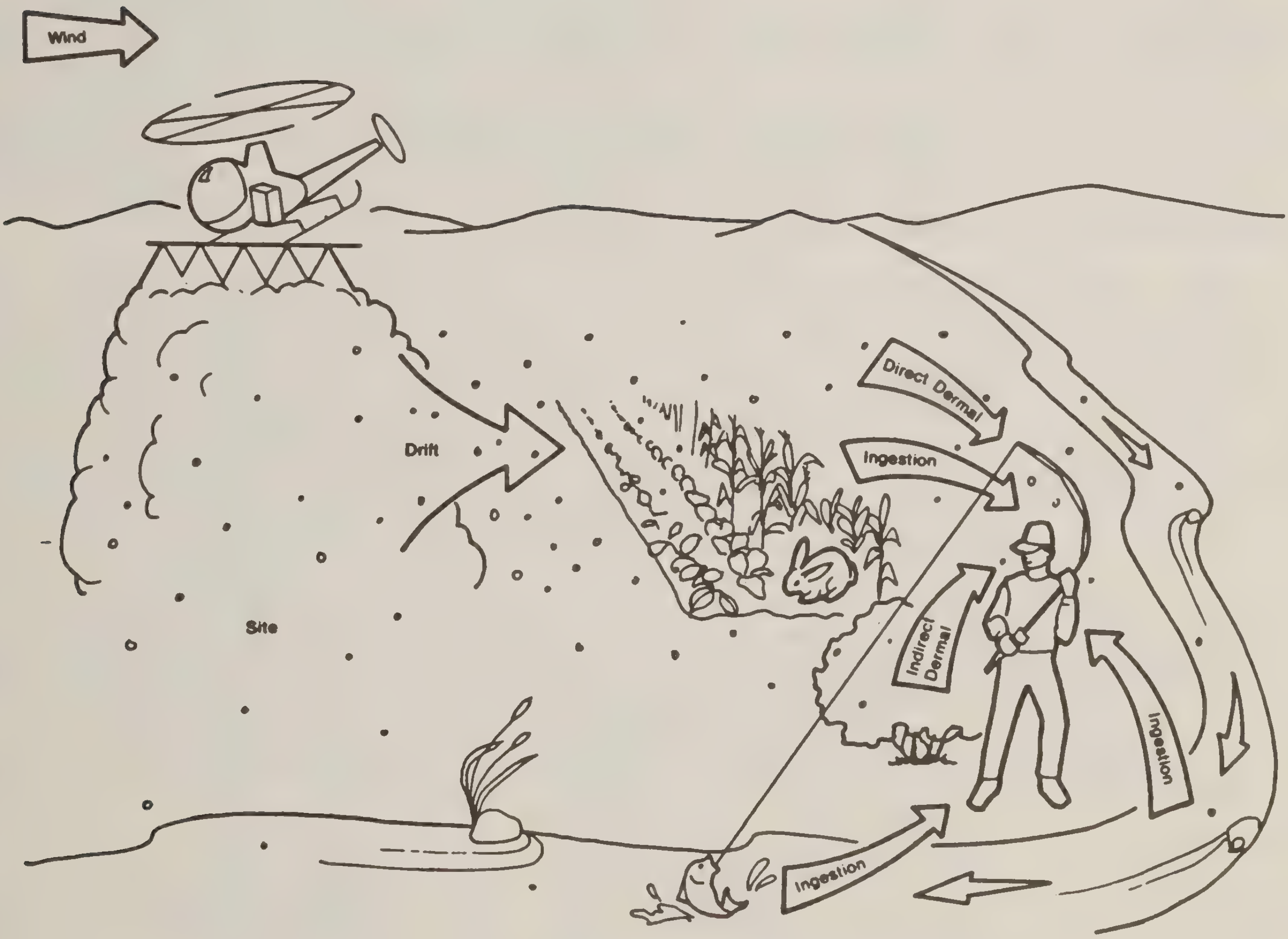


Figure C-5.--Possible routes of exposure to the general public from routine gypsy moth control projects.

route would be by drinking water or eating fish from that stream. Possible routes of exposure from accidents are shown in figure C-6.

Estimating Doses

For exposure to diflubenzuron in each scenario, a range of doses was obtained. Realistic doses are levels that might realistically occur during routine spraying. Worst case doses are very high estimates of the most a person might get in that scenario. These exposures are based on assumptions that fit the real world (that is, that are plausible) but that always overestimate risk. Certain actions, such as warning people about spraying operations and making sure that spraying takes place only under the right weather conditions, would reduce the likelihood of worst case doses.

Most of the doses in this assessment are based on field studies where carbaryl, another insecticide, was used in actual gypsy moth spraying operations. These studies provide a range of dose levels that actually occurred to both workers and residents during spraying operations. Because diflubenzuron is applied in a similar way and the exposure routes are expected to be similar, the carbaryl studies are the best source available for estimating doses in this analysis. But there are some uncertainties in using this method because diflubenzuron has different properties. For example, the amount of time it takes for the chemical to break down, or degrade, varies. In addition, the amount of chemical on the skin that will enter into the body (called the dermal absorption rate) varies.

Thus, in extrapolating the doses from the carbaryl studies to diflubenzuron, these differences must be considered. For example, a 10-percent dermal absorption rate is used for both chemicals even though the estimated absorption rates for each of the chemicals may be lower. In this way, no risks are underestimated. The different degradation rates also are accounted for when determining lifetime doses. The application rate (the amount of active ingredient of chemical applied per acre) is also considered in determining doses. The application rate used in this analysis for diflubenzuron is 0.06 pound active ingredient per acre or twice the rate which is normally used in suppression projects.

After the basic dose for the two chemicals in each scenario was calculated, it was adjusted to account for variations in mixing and application. "Realistic" doses are multiplied by 1.1 to account for normal variations that can increase doses. "Worst case" doses are multiplied by 2.0 to account for abnormal variations that can cause major differences in the amount of spray being deposited. For more detail on mixing and application variations, see pages F-45 through F-47 of Appendix F of the FEIS (USDA FEIS 1985).

Exposure Scenario	Routes of Exposure
Aircraft Spill	
Partial Dermal	Dermal exposure from the spill of a load of insecticide on a person that enters the body only through those areas not covered by clothes.
Full Dermal	Dermal exposure from aircraft spill that enters the body through exposed skin plus through soaked clothes.
Drinking Water	Ingestion exposure from drinking a half gallon of water from a stream where an aircraft spilled 300 gallons.
Eating Fish	Dietary exposure from eating a pound of fish from the site of a 300-gallon spill.
Truck Spill	
Dermal	Dermal exposure from a truck spill that results in 1 gallon of chemical on the skin.
Drinking Water	Drinking a half gallon of water from a stream that had 2,000 gallons of insecticide mixture spilled into it.
Eating Fish	Eating a pound of fish from a stream in which 2,000 gallons of insecticide had been spilled.

Figure C-6.--Possible routes of exposure from accidents.

The estimated realistic and worst case doses for all exposure scenarios are shown in table C-2.

Doses from Routine Operations

Table C-3 summarizes how the realistic and worst case doses were estimated for each scenario for routine operations. (Pages F-27 through F-43 in Appendix F provide specific details about how these doses were determined.) All doses to the public overestimate risk because, in calculating these initial doses, it was assumed that diflubenzuron does not degrade (that is, its level does not decline over time) at all. Thus, the doses for each scenario are the highest that could be expected.

The dietary dose is the only dose not based on the carbaryl studies. This dose is calculated based on insecticide residue levels found in meat, fish, vegetables, and water. Realistic and worst case doses from residues in vegetables and fruits were based on studies of residue levels from agricultural applications of these chemicals.

Table C-2.--Estimated exposure scenarios (milligrams per kilogram per day) to diflubenzuron.

Exposure Scenario	Realistic Doses	Worst Case Doses
ROUTINE OPERATIONS		
Workers		
Mixer/loaders	0.0028	0.012
Observers	0.00013	0.0035
General Public		
Direct	0.00013	0.0006
Drift	0.000087	0.00032
Indirect	0.000026	0.00011
Direct plus dietary	0.00072	0.0079
Indirect plus dietary	0.00061	0.0074
Observer plus dietary	0.00072	0.01
Dietary only	0.00059	0.0073
ACCIDENTS		
Aircraft spill		
Dermal (partial)	2.3	4.3
Dermal (full)	3.5	6.4
Drinking water	0.0015	0.0028
Eating fish	0.00014[a]	0.00025[a]
Truck spill		
Dermal	430	780
Drinking water	0.01	0.018
Eating fish	0.00091[a]	0.0017[a]

[a]Dose is from 4-chloroaniline, a breakdown product of diflubenzuron.

Table C-3.--Methods for estimating doses from routine operations

Scenario	Realistic Dose	Worst Case Dose
Workers		
Mixer/loader	Based on urine levels in mixer/loaders from carbaryl studies. High range (not average) used.	Based on highest dose level (from urine) from carbaryl studies, as well as studies on other pesticides.
Observer	Based on dose level (from urine) in observers in carbaryl studies.	Assumes observer sprayed directly on 2 square feet of exposed skin.
General Public		
Direct	Based on average exposure levels for residents found in carbaryl studies.	Based on highest exposure level to residents reported in the carbaryl studies.
Drift	Dermal dose based on drift found offsite in a number of relevant studies; two-thirds of the amount deposited onsite gets offsite under routine assumptions.	Dermal dose based on two-thirds of amount deposited onsite under worst case assumptions (for example, application rate is multiplied by 2).
Indirect	Based on lowest dose found for observers in carbaryl studies.	Based on highest dose found for observers in carbaryl studies
Dietary	The estimated dietary exposure level is the sum of the following: eating a pound of meat (from two sources), fish, and vegetables and drinking a half gallon of water—all of which have insecticide residues.	
	Goat/Rabbit—Goats and rabbits are exposed through both dermal and inhalation routes.	Goats and rabbits are exposed to very high levels of insecticide.
	Fish—Based on residue levels found in actual field test of water intentionally directly sprayed with carbaryl.	Based on direct application to stream 6 inches deep with no dilution.
	Vegetables—Based on the low range of residue data from agricultural applications assuming vegetables are picked and eaten the same day as treatment.	Based on high range of residue data from agriculture applications.
	Water—Concentration in water calculated by the same method as for fish residues.	

To receive the multiple exposures under the dietary scenario, a person would have to gather and eat the food or drink the water right after the spraying. Although some fruits and vegetables are growing during the spring when gypsy moth spraying occurs, none are mature enough at that time to be harvested. In addition, insecticide residues in vegetables degrade rapidly within 1 or 2 weeks. Thus, the likelihood that people would get doses from eating vegetables or fruit with insecticide residue is very low. But to ensure that even this remote possibility is considered, doses from this food source are included in the dietary dose.

To determine the highest cumulative doses a person could get from all sources, some doses were combined. For example, the dietary dose was added to the direct, indirect, and observer doses to show the most the general public could be exposed to during routine operations.

Doses from Accidents

If an aircraft or truck spilled insecticide, workers and the general public could be exposed to much more than they would under routine circumstances. However, such accidents are rare. (The probability of such accidents occurring which are based on State and Forest Service records of such events, is discussed in more detail in the risk evaluation section). The assumptions and methods used to determine accidental doses are discussed on pages F-52 through F-55 of Appendix F (USDA FEIS 1985).

Aircraft Spills. For aircraft spills, doses are calculated for dermal exposure and for drinking water and eating fish that have insecticide residues. The load dumped is assumed to be 300 gallons. This is the size of the load typically used in gypsy moth spraying. This load could spill over land or into water. Exposures are based on the assumptions that the spill over land hit a person or the person drank water or ate fish containing the spilled chemical.

Truck Spills. For spills from trucks, doses were calculated for dermal exposures and for drinking water or eating fish containing insecticide residue. Because no studies are available on worker exposure from a truck spill, basic dermal doses were based on the assumption that a mixer/loader is exposed to 1 gallon of diluted insecticide a day. The basic dose from drinking water containing insecticide residue was calculated in the same way as for the aircraft spill. Doses from eating fish (exposure to 4-chloroaniline) are a portion of the amount of diflubenzuron in the fish.

Lifetime Exposures and Doses

To determine the risks of long-term health effects such as cancer from exposure to diflubenzuron, it is necessary to know how much of the chemical a person might get in a lifetime. For the linear cancer model (described in the hazard identification section), the total lifetime dose must be expressed in terms of average daily dose. The average lifetime daily realistic and worst case doses are summarized in table C-4.

Table C-4.--Average lifetime daily doses for realistic and worst case exposures from suppression projects (milligrams per kilogram per day)

Exposure Scenario	Suppression Projects (10 exposures)		Combined Eradication and Suppression Projects (16 exposures)	
	Realistic	Worst Case	Realistic	Worst Case
Diflubenzuron (4-chloroaniline)				
Dietary (eating fish)	0.00000011	0.0000023	0.000000079	0.0000037

Routine Operations

To find the lifetime doses from routine spraying, the following information is needed:

1. The length of the lifetime (assumed to be 70 years);

2. The type and number of gypsy moth projects that could take place in the same area during a lifetime;

3. The number of days the insecticides might be sprayed during each project;

4. The amount of chemical a person could be exposed to during each day;

5. The length of time the insecticide stays in meat, on vegetables, or in water (called persistence).

Persistence is considered only in determining lifetime doses (not in determining initial doses). Lifetime doses are based on all the doses a person could get during the time it takes for the chemical to degrade.

The two types of spraying projects generally used to control gypsy moths are eradication and suppression projects. Eradication projects are used in areas where the gypsy moth has become established by artificial means. For example, a mobile home can carry the insect into a new area where it becomes established. Suppression projects usually are conducted only in areas where the gypsy moth is established and spreads naturally.

For eradication projects, it is assumed that the area may be sprayed as many as three times over a 6-week period and that the gypsy moth could be artificially introduced into the same area twice during 70 years. Thus, in a lifetime, a person living in the same place could be exposed to insecticide six times from eradication projects.

It is assumed that the chemical is sprayed only once in each suppression project and that such a project could be conducted in the same area every 7 years. Thus, a person would be exposed 10 times over 79 years from suppression projects.

Because the gypsy moth spreads naturally and can become established in new areas, suppression projects could take place in areas that also had eradication projects.

If so, a person could get as many as 16 exposures in a lifetime (6 for eradication projects and 10 for suppression projects). A detailed discussion of how average lifetime doses are determine is on pages F-73 through F-86 of Appendix F.

Diflubenzuron (4-chloroaniline). Studies show that diflubenzuron does not cause cancer. But it is not known for sure whether a breakdown product of diflubenzuron, 4-chloroaniline, can cause cancer. Because of this uncertainty, it is assumed that 4-chloroaniline can cause cancer. The risk of cancer would come from eating meat or fish, where 4-chloroaniline can be concentrated. Because fish would have the highest level of residue, realistic and worst case doses from eating fish were calculated.

The doses of 4-chloroaniline are figured as a percentage of the estimated doses of diflubenzuron. The residues of 4-chloroaniline in fish would degrade to zero in 60 days. The doses over the 60-day period are then multiplied by the number of exposures in a lifetime and then divided by the number of days in a lifetime to get the average lifetime realistic and worst case doses from 4-chloroaniline.

Accidents

To evaluate cancer risk from accidental exposures to diflubenzuron, average lifetime doses from these exposures must be determined. (These are discussed in detail on pages F-84 through F-86 of Appendix F.) Dermal doses are multiplied by the dermal absorption rate (10 percent) and then divided by days in a lifetime to get the average lifetime dose from accidents. Oral doses are divided by days in a lifetime.

It should be noted that averaging a single large dose over 70 years creates uncertainty in the cancer risk calculations discussed in the risk evaluation section that follows. That is, the actual risks of getting cancer could be higher or lower than those presented in this analysis.

For example, a single large dose from an accident, which might occur only once in a lifetime, might overwhelm the body's normal ability to get rid of the poison or repair the damage it caused. In that case, the risk of getting cancer would be higher than the risk determined here.

On the other hand, the risk might be lower than the risk stated here. For humans, the chemical would be in the body for only one day in a 70-year lifetime. To get the cancer potency, animals were given daily doses over a period about as long as the animal's natural lifetime.

Population at Risk

For every acre sprayed, it is estimated that 14 persons from the general public could be exposed during gypsy moth operations. (A detailed discussion of how this number was determined is on pages F-64 and F-65 in Appendix F.)

Forest Service records show that on average, the insecticides have been used yearly on about 385,000 acres. Assuming an average population density of .22 person per acre, about 2.8 million people live within the Project Area.

Among these 2.8 million, some individuals or groups (for example, infants) might be more sensitive than most people to the insecticide. It is not possible to determine how many people would fall into the "sensitive category". But specific potential health effects on this group are discussed in the risk evaluation section. To be cautious, the NOELs for this group were reduced by an arbitrary safety factor of 100; that is, they are 100 times lower than those used for the general public.

RISK EVALUATION

What, then, are the health risks to workers and the general public from exposure to diflubenzuron?

To determine these risks, the estimated exposure levels (from the exposure analysis and shown in table C-2) are compared with the toxic effect levels (from the hazard identification and shown in table C-1). This comparison indicates whether harm would be caused if the exposure occurs. But the odds of these exposures occurring is another question.

Some exposure scenarios are much less likely to occur than others. Because of the 10-percent correction for normal variations in mixing and spraying, even the realistic doses in the routine scenarios are higher than should occur in most sprayings. The worst case doses in the routine scenarios are far more unlikely. At most, there would be only one worst case exposure for every 500 realistic exposures.

A review of accidents in insecticide-spraying projects suggests that there would be one aircraft spill on land for about every 2,000 flights and one spill on water for about every 17,000 flights. Based on the yearly number of flights in the past, this suggests that gypsy moth projects could have about two aircraft spills every three years. Spills would involve worst case loads once every 800 years.

While truck accidents could lead to the highest exposures, these exposures are the least likely to occur. Based on national accident statistics for similar types of vehicles, trucks used in gypsy moth projects would have one accident for every three million miles traveled. Truck accidents involving spills would occur less than once every eight million miles. Assuming that trucks carrying insecticides travel an average of 100 miles per project, truck spills on land would occur once every 93,000 trips and on water once every 800,000 trips. The odds of a truck spill on land occurring in association with a worst case dose is about 1 in 50 million; on water, 1 in 460 million. (To see how these odds were calculated, see pages F-55 to F-62 in Appendix F, USDA FEIS 1985).

Threshold Responses

Comparison of threshold responses for diflubenzuron under all exposure scenarios are listed in table C-5. When the estimated dose might occur more than once, it is compared to the acceptable daily intake. High one-time doses from accidental spills are compared to the acute lethal dose for dermal exposure. (If the reader wants specific information about how many times the dose is above or below the ADI, NOEL, or LD_{50} values, refer to tables 8 through 15 on pages F-123 through F-130 of Appendix F, USDA FEIS 1985.)

It must be emphasized that the comparisons with ADIs and LD_{50}s could be misleading. The estimated doses from spraying mostly would be one-time or of short duration. Yet the ADIs are doses that can be safely taken every day for a lifetime. Because of the safety factors used to set ADIs, it may be possible that doses just above the ADI would not cause harm. However, for diflubenzuron, all doses are below the current ADI of 0.02 mg/kg/day.

For both the general public and workers, all routine exposures under the worst case lead to doses below the ADIs. All such exposures to the general public include eating food and drinking water that contain spray residues.

Table C-5.--Comparison of estimated doses to established acceptable daily intakes and acute lethal doses for diflubenzuron under different exposure scenarios

Exposure Scenario	Realistic Exposures: Relationship of Est. Dose to: Acceptable Daily Intake (ADI)	Realistic Exposures: Relationship of Est. Dose to: Acute Lethal Dose (Dermal LD_{50})	Worst Case Exposures: Relationship of Est. Dose to: Acceptable Daily Intake (ADI)	Worst Case Exposures: Relationship of Est. Dose to: Acute Lethal Dose (Dermal LD_{50})
Routine Operations				
Workers				
Mixer/loaders	Below		Below	
Observers	Below		Below	
General Public				
Direct	Below		Below	
Drift	Below		Below	
Indirect	Below		Below	
Direct plus dietary	Below		Below	
Indirect plus dietary	Below		Below	
Observer plus dietary	Below		Below	
Dietary only	Below		Below	
Accidents				
Aircraft spill				
Dermal (partial)		Below		Below
Dermal (full)		Below		Below
Drinking water	Below		Below	
Truck spill				
Dermal		Below		Below
Drinking water	Below		Below	

Even if an estimated dose is below the ADI, it still might affect sensitive individuals. The risk analysis assumes that sensitive individuals are 100 times more sensitive to chemicals than the general population. So it is also necessary to look closely at these possible effects. The following section provides this closer look.

DIFLUBENZURON

Routine Operations--Workers. All doses are below the ADI.

Routine Operations--General Public. All doses are below the ADI.

Routine Operations--Sensitive Individuals. There may be two groups that would be at greater risk than the public at large. They are people with genetic defects that make them prone to having methemoglobin in the blood, and very young infants who lack

enzymes that can reduce the level of methemoglobin. Worst case doses that include the dietary component are roughly the same as the lowest NOEL reduced for sensitive individuals. To avoid potential ill effects in these two groups, efforts should be made to keep them from being exposed.

Accidents. All dermal exposures result in doses that are below the dermal LD_{50}. All drinking water doses are below the ADI.

Nonthreshold Responses

Cancer. The probability of cancer being caused by exposure to a chemical is determined by multiplying its cancer potency for humans (as derived through use of the linear model) by the lifetime average daily dose under each of the exposure scenarios.

The cancer probabilities are listed in table C-6. The numbers in this table are weighted lifetime risks for all exposed people. They assume a person is exposed to the chemical, but they also take into account the odds of realistic and worst case exposures occurring. (At most, there would be one worst case dose for every 500 realistic doses.) A worst case dose could raise the odds of cancer two- to twelve-fold.

Table C-6.--Weighted cancer risk to individual if exposed to insecticide under different exposure scenarios (chances in a million over a lifetime)

Exposure Scenario	Diflubenzuron[a]
Routine Operations	
Suppression projects	0.0023
Cumulative eradication and suppression projects	0.0035
Accidents	
Aircraft spill	
Dermal (partial)	0
Dermal (full)	0
Drinking water	0
Eating fish	0.0001
Truck spill	
Dermal	0
Drinking water	0
Eating fish	0.00067

[a]Statistic is for risk of cancer from 4-chloroaniline.

Diflubenzuron. The potential cancer risk from diflubenzuron comes from eating meat or fish containing 4-chloroaniline, a breakdown product of diflubenzuron. The data in table C-6 assume that a person eats meat or fish exposed to diflubenzuron.

The weighted cancer risk from eating fish or meat containing 4-chloroaniline (from the breakdown of diflubenzuron) is about 1.2 in a billion for eradication projects, 2.3 in a billion for suppression projects, and 3.5 in a billion for the combination

of both. There would be less than one incidence of cancer for every 300 million acres sprayed.

In the past, diflubenzuron has been applied to about 141,000 acres per year. Thus the added risk of cancer from using diflubenzuron could be about 0.0005 incidence per year in the exposed population of 2 million people.

Heritable Mutations

The risk of heritable mutations is based on the overall evidence of whether or not the chemicals are mutagenic in humans. As indicated in the hazard identification, diflubenzuron is considered to be non-mutagenic.

SYNERGISTIC AND CUMULATIVE EFFECTS

Because of chemicals already in the environment, it is possible that the risks from using diflubenzuron might be greater than described.

First, diflubenzuron might combine with different chemicals in the environment. By doing so, they might create effects that are greater than the sum of their separate effects. This process is called synergism. Since many possible combinations could occur, the effects of synergism are hard to predict. But based on studies of carbaryl and other chemicals, a 10-fold increase in toxic levels in isolated instances seems to be the most that could happen. This would be the worst case. Most margins of safety would still be acceptable for the general public, but sensitive individuals could be at risk.

Second, diflubenzuron might be in the environment from other sources, so gypsy moth spraying could add to amounts that are already there. Potential sources might be food and spray drift from farm areas where these chemicals are used. But data on chemical residues in food suggest that there would be little, if any cumulative effect. (For more details about synergistic and cumulative effects, see pages F-101 to F-104 in Appendix F, USDA FEIS 1985.)

CLARIFICATION OF INFORMATION ABOUT THE TOXICITY OF DIFLUBENZURON

Review of Toxicity Studies

This section describes more completely the toxicity information that was summarized in Table 3 in Appendix F. This information is being included to clarify for the reader the potential hazards of the insecticide. In addition, this information clarifies the background and basis for selecting the no-observed-effect levels (NOEL) used in the worst case analysis. This section also provides the descriptive background need to identify possible health effects resulting from exposure to diflubenzuron used to control the gypsy moth.

Acute Toxicity. Based on acute oral LD_{50} values greater than 4,640 mg/kg in rats and mice, diflubenzuron can be classified as a slightly toxic insecticide (USEPA, 1984c). The acute dermal LD_{50} for rats was reported to be greater than 10,000 mg/kg, and for rabbits it was greater than 4,640 mg/kg (USEPA, 1984c).

Chronic Toxicity. The major toxic effect observed in test subjects upon exposure to diflubenzuron is the formation of sulfhemoglobin and methemoglobin pigments in the circulatory system. Hemoglobin in its nonoxidized state is essential for the transport of oxygen, whereas the oxidized form, methemoglobin, plays no role in

oxygen transport. Investigators have suggested that there is a correlation between increased levels of methemoglobin and increased levels of sulfhemoglobin.

An 80-week mouse feeding study established a NOEL of 1.1 mg/kg/day based on the formation of methemoglobin and sulfhemoglobin in the test animals (USEPA, 1984c). A 104-week rat feeding study resulted in a NOEL of 40 ppm (2 mg/kg/day) with increased levels of methemoglobin and sulfhemoglobin observed in test animals (USEPA, 1984c). A lifetime oncogenic mouse feeding study also established a NOEL of 16 ppm (2.4 mg/kg/day) based on increased levels of methemoglobin and sulfhemoglobin (USEPA, 1984c).

Teratogenicity and Reproduction. Teratology studies in rats and mice did not result in teratogenic effects at the levels tested (USEPA, 1984c). Maternal toxicity, fetal toxicity, and teratogenic NOELS were established as being greater than 4,000 mg/kg/day (highest dose tested) for both test species (USEPA, 1984c). A three-generation rat reproduction study resulted in no reproductive toxic effects at 10, 20, 40 and 160 ppm (0.5, 1, 2, and 8 mg/kg/day) (USEPA, 1984c; Uniroyal, 1983).

Mutagenicity. Diflubenzuron was found to be nonmutagenic even at high doses (Quarles et al., 1980; MacGregor et al., 1979; and USEPA, 1984c). Concentrations of 500 mg/kg body weight did not produce a mutagenic response in hamster fetal cells (Quarles et al., 1980). Negative results also were obtained for diflubenzuron in the mouse micronucleus test <u>in vivo</u>, the mouse lymphoma mutation assay, and the bacterial Ames mutation assay (MacGregor et al., 1979).

Oncogenicity. No evidence of oncogenicity was observed in any test animals at doses as high as 1,000 ppm (150 mg/kg/day) in the lifetime oncogenic mouse study (USEPA, 1984c). A second oncogenic study that used rats also produced no oncogenic effects even at 10,000 ppm (500 mg/kg/day) (highest dose tested) (USEPA, 1984c). Although diflubenzuron has not been shown to be carcinogenic, one of its metabolic breakdown products, 4-chloroaniline, has been claimed to be a carcinogen. This possibility is discussed in this appendix in the section on cancer potencies.

Possible Dioxin Contamination

The concern that diflubenzuron may possibly be contaminated with "dioxin" became an issue when a list of 60 pesticides possibly contaminated with dioxin was published in the February 20, 1985, issue of <u>Pesticide & Toxic Chemical News</u>. The list, which was from an internal memo prepared by EPA, included diflubenzuron. After discussion with EPA, USDA was able to determine that the list included any pesticide containing a chlorine on benzene ring. EPA also informed USDA that they did not expect any 2,3,7,8-tetrachlorodibenzo-p-dioxin (the one, of 75 possible dioxin compounds, that people refer to as "dioxin") (USEPA, 1985b). Duphar B.V., the registrant of diflubenzuron, has also tested for the possible presence of 2,3,7,8-tetrachlorodibenzo-p-dioxin or tetrachlorodibenzofurans in technical grade diflubenzuron. They found no contamination using a testing method that had a sensitivity of 0.01 ppm (Shadbolt, 1985). From these discussions, USDA concluded that there was no evidence to indicate that diflubenzuron is contaminated with "dioxin".

Clarification of Cancer Potencies and Risks

This section clarifies the cancer potency of 4-chloroaniline, a breakdown product of diflubenzuron. This section also clarifies cancer risks.

Diflubenzuron (4-chloroaniline)

In the Final Environmental Impact Statement, the risks of cancer from 4-chloroaniline (resulting from the breakdown of diflubenzuron) were estimated based on secondary reports because the full data from the National Cancer Institute (NCI) study (NCI) 1979) were not available. Since then, the Forest Service has obtained the data and recalculated the risks accordingly.

The NCI conducted 2-year cancer bioassays of 4-chloroaniline in both rats and mice (NCI, 1979). Dietary concentrations of 4-chloroaniline were 0, 250, and 500 ppm for rats, and 0, 2,500, and 5,000 ppm for mice. The only cancerous tumors found that were considered to be related to the 4-chloroaniline treatment were fibromas and sarcomas in the spleen of male rats and hemangiomatous tumors in mice. In both cases, the incidences of these tumors were not significantly greater statistically than those found in untreated control animals. However, the findings were considered suggestive of carcinogenicity because of the rarity of these tumors in the spleens of rats in the colonies maintained at NCI. These cancer incidence data therefore were used to calculate the worst case cancer potency of 4-chloroaniline assuming the incidence rate to be significant.

The incidence of tumors in rats and mice was as follows:

	Dose		Incidence of Cancer		Cancer Potency	
Animal	ppm	mg/kg/day	Males	Females	Males	Females
Rats	0	0	0.05	--	--	--
	250	12.5	0	--	--	--
	500	25	0.20	--	0.034	--
Mice	0	0	0.1	0	--	--
	2,500	375	0.2	0.06	--	--
	5,000	750	0.28	0.19	0.0036	0.0038

The cancer potency, β, was calculated from the linear cancer model

$$R = \alpha + \beta d$$

For example, the cancer potency of male mice was calculated as follows:

$$R = \alpha + \beta d$$

$$0.28 = 0.1 + \beta \text{ (750 mg/kg/day)}$$

$$= 0.00024 \text{ (mg/kg/da)}^{-1}$$

To extrapolate the cancer potency in mice to humans, the cancer potency was multiplied by the 1/3 power of the ratio of human (70 kg) to mouse (0.02 kg) weight:

$$\beta\text{(Human)} = (70/0.02)^{1/3} \times 0.00024 \text{ (mg/kg/day)}^{-1}$$

$$\text{(Human)} = 0.0036 \text{ (mg/kg/day)}^{-1}$$

The cancer potency of 4-chloroaniline therefore could range from 0.0036 to 0.034 $(mg/kg/day)^{-1}$ depending upon which animal study was used to predict cancer in man. The arithmetic average for males of 0.019 $(mg/kg/day)^{-1}$ was used for this analysis.

Based on the recent cancer bioassays of diflubenzuron, the cancer risk from this chemical could be considered to be zero (USEPA, 1985A). However, because of the uncertainty about the carcinogenic potential of 4-chloroaniline, there may be some risk of cancer associated with exposure to diflubenzuron.

The theoretical pathways for metabolic breakdown of diflubenzuron in soil, water, plants, and animals were described in the Diflubenzuron Decision Document (USEPA, 1979). Diflubenzuron breaks down into either 4-chlorophenylurea or 2,6-diflurobenzoic acid. The 4-chlorophenylurea can further break down to 4-chloroaniline, which can then degrade to 4-chloroacetanilide. A review of the literature shows that 4-chloroaniline is rarely found in nature. The major metabolites of diflubenzuron are 4-chlorophenylurea, 2, 6-diflurobenzamide, or 2,6-diflurobenzoic acid (see USEPA, 1979, and Nimmo et al., 1984). The principal exceptions were fish and animals, with fish having as high as 60 percent of the total diflubenzuron residue found as 4-chloroaniline (USEPA, 1979). Rapid depletion of the residues in fish was reported in the Diflubenzuron Decision Document, but no data on persistence were given.

Arguably, the cancer bioassays for diflubenzuron also have measured the cancer risk associated with 4-chloroaniline because this metabolite would result from any breakdown. However, if a person consumed large amounts of meat or fish containing diflubenzuron, and therefore 4-chloroaniline residues, then he or she possibly could be exposed to higher levels of 4-chloroaniline than were fed the mice and rats in the cancer bioassays. Therefore, the risk of cancer associated with this possible exposure was analyzed.

The realistic and worst case doses of diflubenzuron resulting from residues in fish were estimated to be 0.00003 mg/kg/day (0.06 x 0.0004 mg/kg/day x 1.1) and 0.0006 mg/kg/day (0.06 x 0.0051 mg/kg/day x 2.0) on page F-44 (USDA FEIS, 1985). If 60 percent of diflubenzuron is broken down to form 4-chloroaniline, the 4-chloroaniline doses would be 0.0000096 mg/kg/day (0.00003 mg/kg/day x 0.6 x 127.6/210.7) for the realistic case and 0.0002 mg/kg/day (0.0006 mg/kg/day x 0.6 x 127.6/210.7) for the worst case. (The value 127.6/210.7 is the ratio of molecular weights.) Since no persistence data are available, it was assumed that 4-chloroaniline residue in the fish would degrade to zero within 60 days.

The average dose over the 60-day period therefore would be 0.0000048 mg/kg/day (realistic) or 0.0001 mg/kg/day (worst case). The realistic lifetime dose of 4-chloroaniline resulting from eradication projects is then:

d = 0.0000048 mg/kg/day x 60 days/project x 6 projects/lifetime x 1/25,550 days/lifetime

$d = 6.8 \times 10^{-8}$ mg/kg/day

The worst case average lifetime dose of 4-chloroaniline from eradication projects is:

d = 0.0001 mg/kg/day x 60 days/project x 6 projects/lifetime x 1/25,500 days/lifetime

$d = 1.4 \times 10^{-6}$ mg/kg/day

The average lifetime doses resulting from suppression projects were calculated by multiplying the eradication doses by 1.67, which yields 1.1×10^{-7} and 2.3×10^{-6} mg/kg/day for the realistic and worst case, respectively.

The cancer risk to an individual exposed to diflubenzuron, and therefore possibly to 4-chloroaniline, is calculated as follows for the realistic case from eradication projects:

$$R = \beta d = 0.019\ (\text{mg/kg/day})^{-1} \times 6.8 \times 10^{-8}\ \text{mg/kg/day}$$
$$= 1.2 \times 10^{-9}$$

Cancer risks to an individual for other realistic or worst case doses are presented below:

	Eradication		Suppression	
	Lifetime Dose	Lifetime Cancer Risk	Lifetime Dose	Lifetime Cancer Risk
Realistic	6.8×10^{-8}	1.2×10^{-9}	1.1×10^{-7}	2.2×10^{-9}
Worst Case	1.4×10^{-6}	2.7×10^{-8}	2.3×10^{-6}	4.5×10^{-8}

The cancer risk from accidental spills of diflubenzuron were based on the assumption that an individual would eat 0.5 kg of fish taken from the stream in which the chemical was spilled. To evaluate the risk of cancer from accidental exposure, the single high dose resulting from dermal exposure, water consumption, or fish consumption needs to be expressed in terms of average lifetime dose.

Lifetime Incidences of Cancer Per Acre

To estimate the number of possible incidences of cancer per acre over a lifetime series of applications, the cancer risk is multiplied by the population at risk (14 individuals/acre based on assumptions stated on pages F-64 and F-65 in Appendix F). This translates to the lifetime incidences of cancer per acre for the lifetime number of applications:

	Incidences of Cancer/Acre/Lifetime	
Insecticide/ Exposure Scenario	Suppression (for 10 applications)	Eradication (for 6 applications
Diflubenzuron		
Eating fish/meat	3.2×10^{-8}	1.7×10^{-8}

In a site-specific environmental assessment, total incidences of cancer in the population can be calculated for a single application by dividing incidences of cancer per acre per lifetime by the number of applications (6 or 10) and multiplying by the total number of acres proposed for treatment. For example, for suppression projects, incidences of cancer are calculated as follows:

Diflubenzuron	
Eating fish/meat	No. of acres $\times 3.2 \times 10^{-9}$

In other words, there would be less than one incidence of cancer if diflubenzuron were sprayed on 300 million acres.

Accidents

The cancer risks associated with the accident scenarios for diflubenzuron is shown in table C-7.

Table C-7.--Cancer risks for accidents with diflubenzuron

Aircraft Spill		
Eating fish	1.0×10^{-10}	1.8×10^{-10}
Truck Spill		
Eating fish	6.7×10^{-10}	1.2×10^{-9}

The estimated oral doses that result from a person drinking water that contains insecticide residues are based on the following assumptions:

- The insecticide is applied directly to water (contrary to normal operating procedures);

- Water sources will have a minimum average depth of 6 inches;

- Realistic insecticide concentrations are 50 ppb (0.05 mg/liter) for every 1 lb. a.i. per acre application. Worst case concentrations are 0.707 mg/liter for every 1 pound a.i. per acre application of insecticide;

- Daily consumption of water is 2 liters;

- Water consumed is from a surface spring or stream that had direct application;

- Actual persistence times depend on many environmental factors, but data from gypsy moth projects indicate that residues do not remain in running water for more than 2 to 6 days (see, for example, LOTEL, 1975, and Pieper, 1979). Persistence can be much longer in stagnant water bodies (Giggs et al., 1984), but these are much less likely sources of drinking water;

- It is possible that after spray application, some insecticide might be dislodged by rain within 10 days (based on half-life data) (FEIS, table 2), and runoff into potable water. This may result in a brief increase in the concentration of insecticide in water. The transitory nature of these residues and the relatively small contribution of drinking water to human exposure compared to the dermal exposure values already estimated (p. F-32) indicate that runoff is not a significant contribution factor for exposure and is thus not considered in this analysis.

BIOLOGICAL PESTICIDE BIOBURDEN

APPENDIX D

BIOLOGICAL PESTICIDE BIOBURDEN

The following letter reviews the concern that some Bacillus thuringiensis products may contain disease-causing organisms and concludes that there is no hazard to human health associated with the use of Bt in forestry applications.

United States Department of Agriculture

Forest Service

WO

Reply to: 2150

Date: April 27, 1988

Subject: Biological Pesticide Bioburden

To: Regional Foresters, Station Directors, and Area Director

The safety of products containing Bacillus thuringiensis var. kurstaki Berliner (Bt) has recently been questioned. Several Forest Pest Management staffs, including the Washington Office, have investigated these concerns and we wish to clarify the situation as we understand it.

This letter summarizes information collected from the U.S. Environmental Protection Agency (EPA), the Food and Drug Administration, concerned publics, and private industry sources. As a result of our data collection activities, we do not feel that forest pest control efforts intending to use Bt will require additional product testing. We recommend that projects proceed in accordance with the Federal Insecticide, Fungicide, Rodenticide Act, as amended, the National Environmental Policy Act, as well as other applicable laws and regulations.

The safety of conventional chemical pesticides used in forest pest management programs has long been questioned. Now the biologicals have been drawn into the picture. For example, questions concerning the safety of Bt stem from rumors of potential human illness, including vomiting and diarrhea, along with rumors of disease-causing microorganisms in Bt products (sometimes characterized as the Bt bioburden). These rumors, to date, have been determined to be without basis in scientific fact.

The U.S. Environmental Protection Agency has also reviewed the situation and it is our understanding that they too believe the concerns about Bt are unjustified. Discussions with the product manager for biological pesticides have resulted in our concluding that EPA believes that neither human health nor environmental problems have been demonstrated previously nor do they expect any now.

In over 18 years of Bt use, there have been no scientifically-documented cases or evidence of Bt-caused illness directly attributable to forestry-use situations. This long history of use and a special study on the health effects of Bt spray programs conducted by the Oregon Department of Human Resource's Health Division between 1985-87 have not resulted in any cause and effect relationships between Bt use and human illness. Thus, they appear to corroborate the apparent safety of this biological pesticide.

Low levels of extraneous microorganisms do exist in Bt; however, these low levels do not affect the overall safety of Bt. The same environmental bacteria are also present at similar levels in water, food, milk, and other dairy products. The chances of exposure to low levels of extraneous microorganisms may be greater from eating or drinking ordinary food products than from Bt use in forestry.

Another concern recently expressed was the possibility of enterotoxins (e.g. intestinal or enteric streptococci such as Streptococcus faecalis and S. faecium) being present in Bt products. Manufacturers of Bt products advise us that due to steps taken in the manufacturing process, it is unlikely that enterotoxins would be present in distributed products.

A final concern has been Bt contamination of food or feed. Given current information, and under forestry use conditions, the probability of Bt contaminating food or food products is highly unlikely. During all the years of Bt use in agriculture and forestry, no evidence has been seen that Bt grows on food, produces enterotoxins, significantly increases the bioburden, or causes unacceptable contamination.

Manufacturers of Bt products are required by law to test each lot of Bt technical material produced. Each lot is tested for pathogenicity and vertebrate toxicity. Therefore, additional testing by the FS is believed unnecessary. At this time, we concur with EPA's analysis that there is no hazard to human health associated with the use of Bt in forestry. However, should managers of individual spray programs wish to independently test products, we have enclosed a protocol for sampling products delivered to treatment locations. Also included are recommended testing methodologies and an indication of appropriate test facilities.

In summary, after reviewing these concerns and possible alternative approaches to dealing with them, we have decided not to initiate an independent product testing and analysis program at this time. We believe projects planning to use Bt and/or other microbial pesticides should proceed as planned. In the meantime, the Forest Service will continue to monitor new information and advise you of any changes in the agency's position.

/s/ Allan J. West

ALLAN J. WEST
Deputy Chief

Enclosure

cc: Abbott Laboratories, Inc.
Sandoz Crop Protection, Inc.
NOVO Laboratories, Inc.
Mike McDonald (USDA-OBPA)
W.E. Stewart, AgCanada
James Space (WO-FPM)
M. Ollieu (WO-FPM)
D. Hamel (WO-FPM)
P.Hutton, EPA

FPM:DHAMEL/DRH/4:27:88

RECOMMENDED PROTOCOL FOR SAMPLING AND TESTING PESTICIDES FOR MICROBIAL ANALYSIS IN COOPERATIVE FOREST PEST MANAGEMENT PROJECTS F.Y. 1988

INTRODUCTION:

The USDA Forest Service (FS) is not requiring testing of products used in forestry spray programs since we believe that there is no human health hazard to be associated with spraying Bt. However, if independent testing is done, the following procedures are highly recommended for use in order to assure test validity.

Sampling technique is critical; contamination of products can come from inappropriate sampling technique, therefore only trained personnel should handle the sampling procedures.

Once the testing is complete, the data interpretation may be difficult. It will not be uncommon to find extraneous microorganisms in Bt preparations. However, no adverse effects have ever been reported to be associated with the presence of these extraneous organisms. Therefore, drawing conclusions from the data regarding the safety should be done with extreme care.

I. SAMPLING:

1. For each lot number of concentrate collect two samples. One sample will be used for testing and one sample will be used for back-up. Where tanker trucks are concerned, collect two samples from each tank-car compartment.

2. Prior to drawing the samples, agitate the drum by turning it over at least ten times. If an automatic drum roller is available, roll the drum at least 15 times. Where samples are to be drawn from tank trucks, the sampling must be performed when the truck arrives at the delivery site. Sufficient mixing of product will occur during transport.

3. Collection bottles must be sterile and rubber gloves should be worn during the taking of samples. It is recommended that 125 ml widemouth Nalgen bottle or similar collection device be used. Where possible, use square bottles to facilitate storage. Sterile pipettes must be used for transferring materials from the container to the sterile bottle. Where dry powders are used, do not agitate the container; use a sterilized scoop to transfer the material from the container to the sterile bottle. Samples taken should fill bottles 3/4 full.

Extreme care must be taken not to contaminate the sampling bottle or bottle cap during sampling. In order to assure proper sampling technique, sampling crews should be State health officials or certified microbiologists. If a microbiologist is not available, contact your nearest FPM Field Office for additional advice. Do not attempt to collect samples unless the sampling personnel are adequately trained in public health microbiological techniques.

4. Label the sample with a "Sharpie" or other type of indelible pen. Write directly on the bottle. This will ensure that the label information does not wash off if the bottle becomes wet. Each bottle should be labeled with the following data:

a. Product Name, Lot Number, EPA Establishment No., when available (not the EPA Registration Number).

b. Date sampled.

c. Name, Affiliation, and Title of Collector: (Example: Dave Smith, Health Inspector, State Department of Public Health).

d. Location of Sampling.

e. Time sample was collected.

f. Where possible, remove the product label and ship it with the sample.

5. After the sample has been collected, immediately place the bottle in a refrigerator or cooler with ice and hold until samples are shipped. (Do not hold samples in cold storage any longer than two weeks before shipping. Do not freeze samples prior to shipping).

6. Ship all samples as quickly as possible to an appropriate microbiological testing laboratory with the capability to follow the procedures outlined herein.

II. TESTING:

Enterococci Screening: NOTE: Observe aseptic precautions throughout the test.

Enterococcosel Agar: Use Baltimore Biological Labs Enterococcosel Agar, No. 12205. Prepare and sterilize according to the manufacturer's directions.

Sample Preparation: Aseptically transfer 10.0 g or ml of the sample into a flask containing 90 ml of sterile, ph 7.2, phosphate buffer. NOTE: It may be necessary to dilute further so that 1 ml of the final dilution will be expected to yield between 30 and 300 colonies.

Procedure: Transfer 1 ml of each of the sample preparation dilutions into each of 2 sterile Petri dishes. Promptly add to each dish 15 to 20 ml of Enterococcosel Agar medium, previously melted and cooled to 46 to 50 degrees Centigrade (C). Cover the dishes, mix dishes, and allow contents to solidify at room temperature. Invert the dishes and incubate at 35-37 degrees (C) for 72 hours. Count the number of typical enterococci (brownish-black colonies surrounded by a black zone in the agar). Determine the average count. Confirm the presence of enterococci by gram strain--enterococci are gram positive cocci in chains--of a typical colony. Multiply the average count of the confirmed enterococci by the dilution factor, and report the result as the number of enterococci colonies per gram of sample.

III. COLIFORM SCREENING

Coliform Screening: NOTE: Observe aseptic precautions throughout the test.

Violet Red Bile Agar: Use Baltimore Biological Labs Violet Red Bile Agar, No. 11807. Prepare and sterilize according to the manufacturer's direction.

Sample Preparation: Aseptically transfer 10.0 g/ml of the sample into a flask containing 90 ml of sterile, pH 7.2, phosphate buffer. NOTE: It may be necessary

to dilute further so that 1 ml of the final dilution will be expected to yield between 30 and 300 colonies.

Procedure: Transfer 1 ml of each of the sample preparation dilutions into each of 2 sterile Petri dishes. Promptly add to each dish 15 to 20 ml of Violet Red Bile Agar medium, previously melted and cooled to 46 to 50 degrees (C). Cover the dishes, mix the test solutions and the medium by tilting and rotating the dishes, and allow contents to solidify at room temperature. Invert the dishes, and incubate at 30-35 degrees (C) for 24-48 hours. Count only the number of typical coliform colonies, purplish red colonies of 1 to 2 mm diameter surrounded by reddish zone of precipitated bile in the agar. Determine the average count. Confirm the presence of coliforms by gram stain-- coliforms are gram negative rods-- of a typical colony. Multiply the average count of the confirmed coliforms by the dilution factor and report the result as the number of coliform colonies per gram of sample.

IV. INTERPRETIVE GUIDELINES

There are no definitive standards for acceptable levels of extraneous microorganisms in Bt preparations. Enterococci and coliforms should be used as indicator organisms because high numbers of these organisms signify the potential for the occurrence of truly pathogenic organisms. However, currently there are no established standards for these indicator organisms in microbial pesticides. The mere presence of these organisms has not been demonstrated to affect the safety of Bt products.

A normal Bt preparation contains 10^{10} Bt spores per ml. It is common practice to regulate impurities at levels of 0.1% or greater, which would be 10^7 organisms per ml.

In order to assure a 10^2 margin of safety, an arbitrary level of 10^5 enterococci per ml is being set for guidance, and a 10^3 level of coliforms. These levels are arbitrary and are for guidance purposes only (10^5 enterococci per ml translates into 0.001% impurity; 10^5 coliforms per ml translates into 0.00001% impurity). Numbers of these organisms higher than the listed guidelines would suggest that additional testing may be required.

In this case, contact the nearest Forest Pest Management Office since we have made arrangements with some Bt manufacturers to take an extra, aseptically-collected file sample of end-use product for potential followup testing by the agency. These samples will be analyzed by the agency or an independent contractor to settle discrepancies in levels of microbial bioburden identified by users.

SUMMARY OF RECENT RESEARCH STUDIES ON ENVIRONMENTAL FATE OF DIFLUBENZURON (1986–1988)

APPENDIX E

APPENDIX E

SUMMARY OF RECENT RESEARCH STUDIES ON ENVIRONMENTAL FATE OF DIFLUBENZURON (1986-1988)

The following recent studies on the environmental fate of diflubenzuron are summarized for the reader. This is not an all-inclusive list, but only those studies that were found by the EIS Team during literature reviews for this document. In general, the studies support the relative safety of diflubenzuron when applied at registered rates to the forest environment.

Blumberg, A. Y. 1986. Survey of aquatic, soil and soil surface invertabrate fauna in a North Carolina forest (pre- and post-application of dimilin WP-25) Final Report. Duphar B. V. WEESP, Holland, Int. Doc. No. 56635/24/86. 42 pp.

Description - A 10-acre forest in North Carolina was treated with diflubenzuron at 2 oz. a.i. per acre for a field dissipation study. Bio-samples were collected from various environmental compartments.

Results - No obvious trends in population number of invertebrate fauna were evident that could be reasonably attributed to the effects of the application of diflubenzuron.

Jones, A. S. and Lochenderfer, J. N. 1986. Persistence of diflubenzuron (Dimilin) in a small eastern watershed and its impact on invertebrates in a headwater system. (Progress Report). Duphar B. V. S. Graveland, The Netherlands. Document No. 1417. 9 pp.

Description - A 74-acre watershed on the Fernow Exp. Forest in West Virginia was treated with diflubenzuron at the rate of 0.06 lbs active ingredient (1 oz a.i./ac). A 96 acre watershed served as a control. Residue samples (pre and post treatment) were collected for a field persistence study. Residue samples were collected from water, sediment and forest floor. Samples were also collected to determine the amount of insecticide reaching the stream. At 45 minutes post-spray, the first of seven rainfall events occurred during the one week post-spray period.

Results - Analysis of petri dishes from stream channels showed that from 2.25 to 27.4 g/ha reached the stream, depending on the amount of canopy closure. Analysis of water samples for stream residues for the first 20 hours after spray application revealed levels of 100 ppt immediately after application. At 45 minutes post-spray, heavy rain occurred and residues in the stream increased to 2.1 ppb, and quickly fell back to 100 ppt after the rain event stopped. Thereafter, residues of diflubenzuron decreased below the limits of detection, 25 ppt by 19 hours post-spray. Analysis of sediment and forest floor samples as well as invertebrate samples was not completed at the time of this report.

Kingsbury, P., K. M. S. Sundaram, S. Holmes, R. Nott and D. Kreutzweiser. 1987. Aquatic fate and impact studies with Dimilin. Forest Pest Management Institute, Canadian Forest Service. Sault Ste. Marie, Ontario. File Report No. 78. 45 pp.

Description - A 25-ha (62 acre) forest block was treated with diflubenzuron to evaluate fate and impact on two pond ecosystems. Both ponds were directly sprayed with diflubenzuron at an application rate of 70 g active ingredient per ha (0.5 oz a.i./ac).

Results - The rate of dissipation of the chemical was rapid in all substrates studied with non-detectable levels (<0.10 ppb) observed in 20 days for water, 5 days in sediment, 10 days in aquatic plants and three days in fish. The greatest effect was on crustacean zooplankton, especially cladocerans. Recovery of populations of even the most severely affected organism was well established by three months after treatment.

Martinat, P. J., V. Christman, R. J. Cooper, K. M. Dodge, R. C. Whitmore, G. Booth and G. Seidel. 1987. Environmental fate of Dimilin 25-W in a central Appalachian forest. Bull. Environ. Contam. Toxicol. 39: 142-149.

Description - An aerial application of 0.5 oz a.i. per acre of diflubenzuron was made to an oak forest in West Virginia to control gypsy moth. A two year study was initiated to study the environmental fate of diflubenzuron in litter, foliage, arthropods, and insectivorous forest birds.

Results - The overall trend in all samples was that of decreasing residue levels over time. On day 21, residues in canopy birds were .09 ppm while those in low foraging and ground birds had dropped below detection limits (less than 0.03 ppm). Residue levels in foliage and canopy insects were higher than those in canopy feeding birds, indicating that diflubenzuron does not bioaccumulate at higher tropic levels.

Martinat, P. J., C. C. Coffman, K. Dodge, R. J. Cooper, and R. C. Whitmore, 1988. Effect of diflubenzuron on the canopy arthropod community in a central Appalachian forest. J. Econ. Entomol. 81(1): 261-267.

Description - Canopy arthropods were sampled in a two year study following the aerial application of diflubenzuron (Dimilin 25W, .5 oz a.i./ac) for the control of gypsy moth.

Results - Besides reductions in gypsy moth larvae, significant reductions due to diflubenzuron were found in canopy macrolepidoptera and non-lepidopteran mandibulate herbivores. Sucking herbivorous insects, microlepidoptera, and predaceous arthropods were not affected. The study concluded that the effects of Dimilin on forest bird population due to reductions in canopy insect was probably minimal.

Mutanen, R. M., H. T. Siltanen, V. P. Kuukka. 1988. Residues of diflubenzuron and two of its metabolites in a forest ecosystem after control of the pine looper moth, Bupalus Piniarius L. Pestic. Sci. 23: 131-140.

Description - Diflubenzuron was used to control the pine looper in a 1160-ha (2,866 acre) stand of Scots pine in eastern Finland. Residues of diflubenzuron and two of its metabolites, 4-chloroaniline and 4-chlorophenylurea, were determined in water, pine needles, litter, humus, boleti and other wild mushrooms.

Results - In water samples taken from the treated area, diflubenzuron was still detected at concentrations of 0.1 ug per litre two months after application. No diflubenzuron was detected in the area the following year, nor outside the treated area. Neither metabolite was detected at any time. After two months, no residues were detected in groundwater. Residue in litter and humus decreased from 0.6 to 0.5 mg per kg in one week. Residues increased in one plot from 0.6 to 1.4 mg per kg the following year in the litter layer, probably due to needle fall during the autumn.

Sundaram, A., A. Retnakaran, A. G. Raske, and R. J. West. 1987. Effect of application rate on droplet size spectra and deposit characteristics of Dimilin spray. Pesticide Formulation and Application Systems: Seventh Volume, ASTM STP 968, G. B. Beestmain and D. I. B. Vander Hoover, Eds, Am. Soc. for Testing and Materials, Philadelphia, pp. 104-115.

Description - Diflubenzuron (Dimilan 25WP) was aerially sprayed as an aqueous suspension over four 15-ha (37 acre) plots in coniferous forests in Newfoundland using different volume and emission rates of application.

Results - The higher emission rate of 48.13 L/min resulted in larger droplets, higher droplets/cm^2, and greater recovery of the applied spray volume at ground level. The lower emission rate of 20.48 L/min had smaller droplets, lower droplet/cm^2, and a smaller percent recovery at ground level. It was concluded that the lower application rate might provide a better target coverage at canopy level, with minimum ground contamination.

Sundaram, K. M. S., A. Sundaram and R. Nott. 1987. Droplet deposits and persistence characteristics of diflubenzuron in forest litter and soil after aerial application of Dimilin WP-25 formulation at three volume and emission rates. Duphar, B. V. WEESP, Holland. 29 pp.

Description - Droplet deposits and persistence characteristics of diflubenzuron in forest litter and soil were studied after aerial application of Dimilin WP-25 at 70 g a.i. per hectar, using three volume (10, 5, and 2.5 L/ha) and emission (120, 60 and 30 L/min) in a mixed forest near Kaladar, Ontario.

Results - The maximum concentration of the chemical found in the highest volume and emission were for litter, 6.46 ppm three hours post-spray and for soil, 1.03 ppm six hours post-spray. Residues dissipated to undetectable levels (less that 0.05 ppm) within seven days. The study concluded that diflubenzuron does not persist in forest soil and litter and vertical downward mobility is practically absent.

Van den Berg. 1986. Dissipation of diflubenzuron residues after application of Dimilin WP-25 in a forestry area in North Carolina and some ecological effects. (Summary Report). Duphar B. V. WEESP, Holland Report No. 56637/47/1986. 11 pp.

Description - A 10-acre forest in North Carolina was treated with diflubenzuron at 2 oz. a.i. per acre (four times normal application rate used for gypsy moth suppression) for a field dissipation study. Residue samples were collected from water, soil, sediment and foliage.

Results - Diflubenzuron residues of 0.1-0.2 ppb were measured in water at day one and dropped below detectable levels (below 27 ppt) from the third day onward. In sediment, no residues were detected. In soil, residues were 0.02 mg/kg at day one and declined below detectable levels after 14 days. On leaves, after 63 days about 25 percent of the original residue was left.

RESEARCH AND METHODS IMPROVEMENT ACTIVITIES IN THE AIPM AREA

APPENDIX F

APPENDIX F

RESEARCH AND METHODS IMPROVEMENT ACTIVITIES IN THE AIPM AREA

I. Gypsy Moth Research in Support of AIPM Conducted in 1988

A. Improve Gypsy Moth Trap Performance for Population Monitoring

A study was supported by a cooperative agreement with the Animal and Plant Health Inspection Service (APHIS) to design and develop a better gypsy moth pheromone-baited trap that can monitor populations over a range of densities. University of Massachusetts scientists are conducting laboratory and field evaluations of new trap designs and improved pheromone dispenser systems. Scientists at Virginia Polytechnic Institute & State University (VPI & SU) are conducting research to determine the optimum intertrap spacing for disparlure-baited gypsy moth traps. Agricultural Research Service scientists are cooperating with University of Massachusetts investigators to ascertain the rate of pheromone release from newly designed dispenser systems. Work on these studies began in the spring of 1988.

B. Accelerate Development of the Sterile Gypsy Moth Technique

Scientists of NEFES in Hamden, CT worked on developing more competitive strains of gypsy moth for use in evaluating the partial sterility technique in the AIPM area. Research objectives of this effort included: (1)developing and implementing a system which will maintain and/or improve fitness of the NJSS (New Jersey Standard Strain) for use in the F1-sterile egg release pest management program; (2) establishing one or more backup strains for production of F1-sterile egg masses in 1989 for field evaluation in 1990; and 3) identifying which traits that improve competitiveness of F1-sterile insects can be selected and then intiating research to establish these traits in laboratory cultures.

C. Increase the Effectiveness of Chemical and Microbial Insecticides

Research under a cooperative agreement with scientists at the Pennsylvania State University and NEFES at Hamden, CT was directed at improving the formulation and application of microbial products as well as evaluating the aerial application expert system described in E. (below). Funds were also made available to support a multiagency test of the microbial insecticide Bt in West Virginia and Virginia. The test was designed to provide information on the best way to apply Bt given local conditions.

D. Microbial Insecticide Formulation

NEFES, FPM and AIPM initiated a cooperative agreement with APHIS to produce enough gypsy moth cadavers to provide approximately 1,000 acre equivalents of Gypchek for field use in the AIPM Project. NEFES will process the virus, determine its potency and provide for quality control. Funds have been provided to purchase equipment that will enable scientists to accelerate virus processing and improve the quality of the final product.

E. Develop an Aerial Application Expert System

A study to develop an aerial application expert system was accelerated to provide more detail on four decision support modules. The prototype system will be tested in FY 1989.

F. Accelerate Completion of the Gypsy Moth Life System Model

Researchers at NEFES in Morgantown, WV are continuing the refinement of the gypsy moth life system computer model, especially as users attempt to use it and report difficulties. In order to ensure continued model development, a new modeler was hired and new computing equipment was purchased.

G. Accelerate Biotechnological Research

This effort involves long-term basic research in the study and characterization of the pathogenic mechanism in the gypsy moth (NPV) virus.

H. Accelerate Hazard Rating Research

Hazard-rating research has been accelerated in West Virginia, Virginia and Maryland by NEFES scientists in Morgantown, WV. Computer hardware and software were purchased so that various factors influencing hazard rating and stand susceptibility can be displayed in the context of a geographic information system (GIS) that is compatible with the system that FPM will use in the AIPM area.

I. Test Silvicultural Guidelines

Silvicultural guidelines are being converted to the US Forest Service Data General (DG) computers and cooperators' micro-computers for ease of use by National Forest System and State personnel. Funds were made available for converting a silvicultural prescription program (SILVAH) for use on both the DG and microcomputers; funding was also provided to hire field crews to install silvicultural treatments for testing.

II. Proposed Research Targets - 1989

A. Determine effects of gypsy moth defoliation on native leaf-eating insects.

B. Determine effects of gypsy moth defoliation on habitat and food for games species including fish, endangered, threatened, and sensitive species and aquatic organisms.

C. Improve Gypchek formulation to achieve single application efficacy.

D. Evaluate various Bt products to determine most efficacious formulations.

E. Determine impact of gypsy moth defoliation on water quality and quantity.

F. Determine the relationship of male moth captures to other life stages of the gypsy moth.

G. Develop disease-free/straggle-free strain of gypsy moth.

H. Improve, refine, and test phenological model.

I. Establish test of focal area concept in Massachusetts.

J. Development of operationally sampling technique for gypsy moth populations in urban/suburban areas.

K. Accelerate development of a more competitive strain of gypsy moth.

L. Impacts on pine-hardwood mixtures on the Piedmont and Coastal Plain.

M. New markets/uses for gypsy moth-killed oak.

N. Egg phenology (timing of hatch).

III. AIPM-Sponsored Methods Improvement/Pilot Projects - 1988

A. Aerial application of Gypchek (2 gallons/acre, 5 x 10" PIB/ac and 2 applications).

B. Ground application of Luretape at 700 gm a.i./ha.

C. Aerial application of three volumes of <u>Bt</u> (neat, 1 gallon/acre, 2 gallons/acre) with 20 BIU.

D. Determine persistence of Dimilin on bark, twigs, and ground litter.

IV. Planned AIPM-Sponsored Method Improvement/Pilot Project - 1989

Methods Improvement/Pilot Study

1. Aerial application of Gypchek
   -- 2 applications (standard formulation) - vs. 1 application
   -- standard formulation - medium (11-250 egg masses/acre) density population

2. Ground application of Luretape, 2nd year evaluation

3. Aerial application of <u>Bt</u> (includes nontarget Lepidoptera)
   -- Foray (3 volumes) - high density populations
   -- Neat formulation - medium density populations

4. Mass Trap (9 traps/acre)

5. Silvicultural options

6. Dimilin - reduced dose - medium density population

7. <u>Bt</u> and mass trap

8. Inherited Sterility (sterile males)

9. Dimilin - residue persistence (early and normal timing) 2nd year evaluation

   -- Nontargets -
      -aquatic/terrestrial salamanders
      -aquatic macroinvertebrates
      -leaf litter arthropods

10. Aerial application of <u>Bt</u> and Dimilin against medium (11-250 egg masses/acre) population

V. Research Being Conducted by Other Groups (Primarily the National Park Service)

Epizootiology of entomophaga sp. n.r. aulicar, a fungal pathogen of the gypsy moth; Soper, Richard S. (Dr.), 1986; USDA Agricultural Research Service.

Gypsy moth defoliation survey; Tigner, Timothy G., 1974; Virginia Division of Forestry.

Gypsy moth risk assessment for the Shenandoah National Park, Bowersox, Todd W., 1986; State College, PA (completed).

Parasites and invertebrate predators associated with gypsy moth life stages in Shenandoah National Park; Reardon, Richard D., 1986; USDA Forest Service, FPM.

Population structure of gypsy moth in a permanent plot in Shenandoah National Park; Roberts, E.A.; Ravlin, F.W., 1984.

A pilot project to assess the effects of Gypchek on gypsy moth; Morris, Cal YDF, Cindy Huber, USFS 1985 (completed).

Parkwide gypsy moth population monitoring; 1983; Park Staff.

Response of black bears to gypsy moth infestation in Shenandoah National Park, VA; Vaughan, Michael, 1985; US Fish & Wildlife Coop. Unit and VPI and SU.

Gypsy moth induced tree mortality monitoring; 1987; Park Staff.

Pesticide Precautionary Statement

Pesticides used improperly can be injurious to humans, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

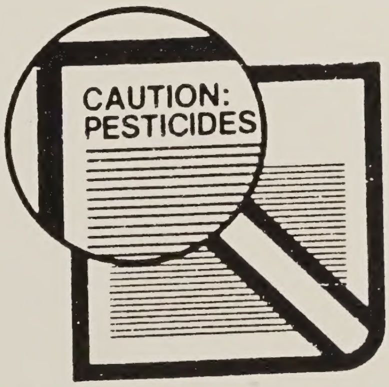
Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first-aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the Federal Environmental Protection Agency, consult your county agricultural agent or State extension specialist to be sure the intended use is still registered.



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